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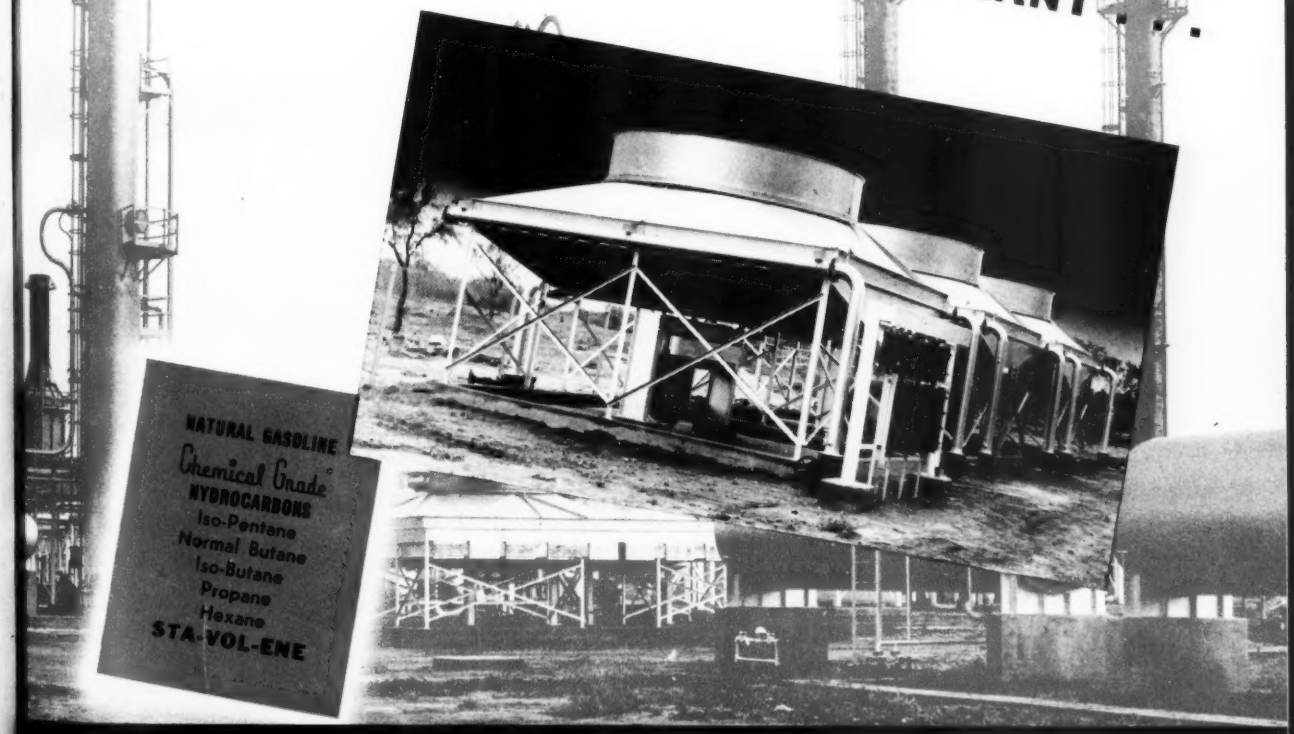

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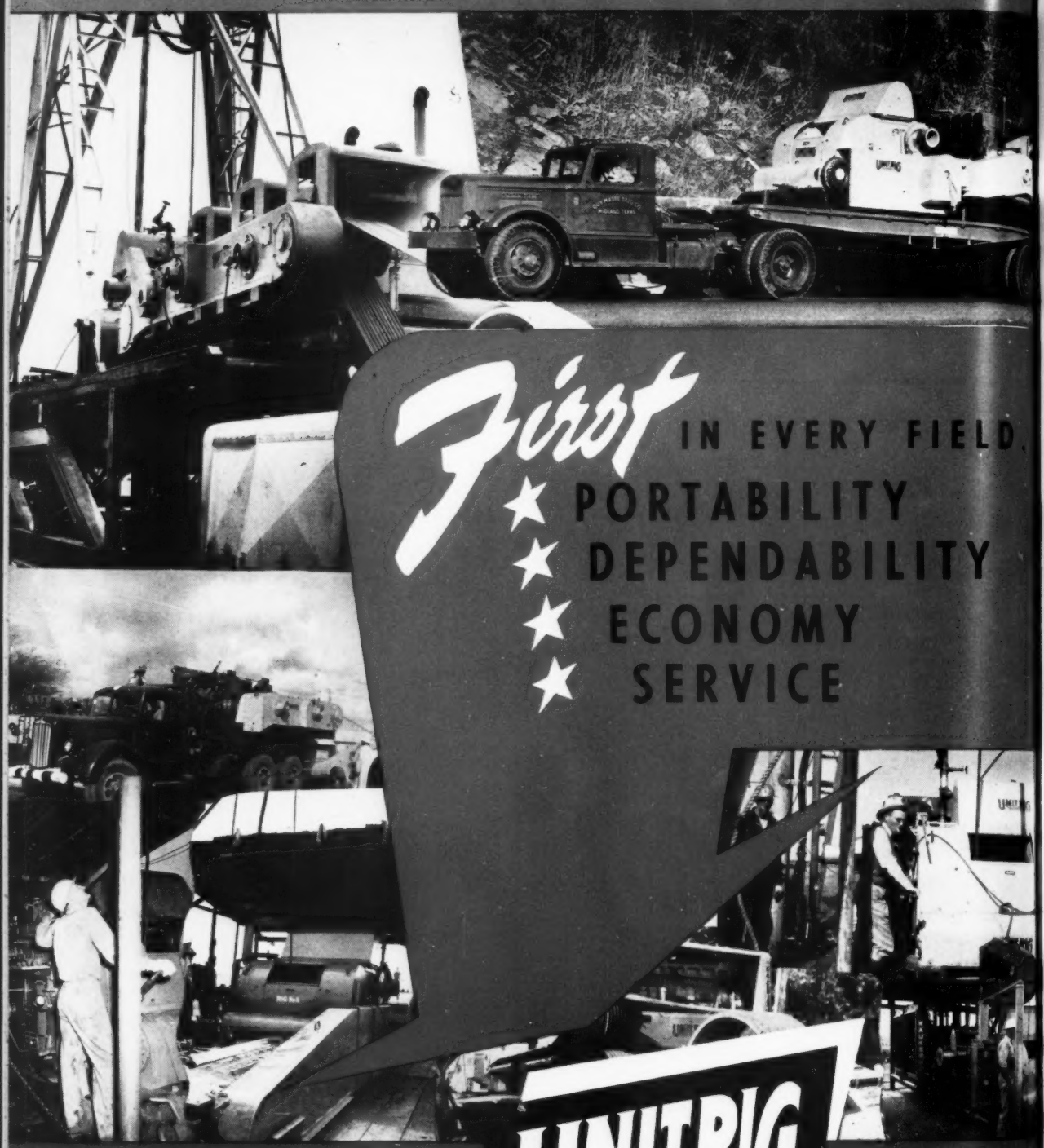

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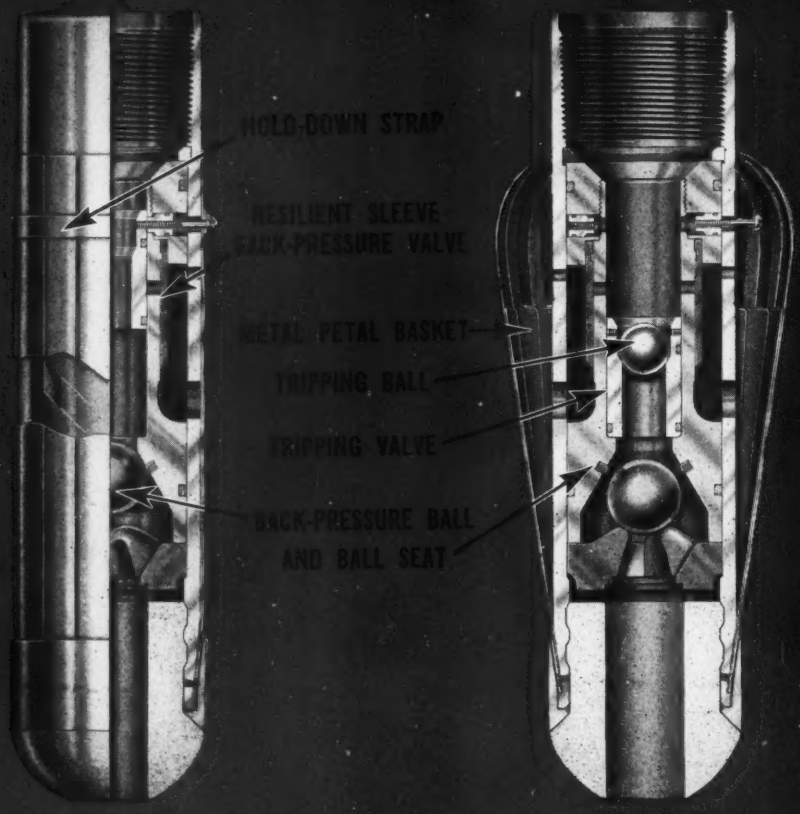

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A Refinery Forum

THE semiannual meeting of the American Petroleum Institute refinery division last week emphasized the potentialities of a yearly refinery forum covering the manufacturing activities of the petroleum industry. At St. Louis it was apparent that there is place for a meeting devoted to refiners at which problems of a general and specific character can be discussed and solutions arrived at.

Refinery technology is moving more rapidly than ever before in several directions. Its research, development, and operating personnel include many leaders in industrial accomplishments. As laboratory building programs are completed, and technical and professional schools provide the additional manpower, the refining division will further strengthen its front-line position in the application of manufacturing arts to the progress of this industry with the sound base of scientific and practical training.

In increasing numbers those coming from the plants and laboratories are becoming members and leaders of professional societies where in some instances special divisions and sections have been established whose activities are devoted exclusively to the refining division. The information and contacts obtained through these professional organizations have a value which extends outside the petroleum industry.

Refiners also have their well-established sectional trade associations serving needs within important refining areas. Universities in increasing numbers are conducting training schools for refinery employes.

But despite these organizational facilities it is apparent that refiners require a national meeting of their own at which they can coordinate their varied activities and arrive at common solutions to common problems. For example, at St. Louis there were reports from standing committees on petroleum-product specifications, disposal of refinery waste, training in refinery work, and other research and operational matters having to do with immediate and long-range planning.

In these sessions there must be free discussion without regard to the size or scope of the operations represented. One of the thought-provoking papers presented at St. Louis was a projection of refinery yields to 1950 of a typical refinery, taking into consideration processing and economic trends. There were disagreements as to conclusions among those present, but the discussion was beneficial to all.

And so we agree with those who feel that the semiannual meeting should become a yearly affair with the scope of its activities broadened, to the end that the refinery division can direct most efficiently its many-headed technical activities with a forum for other matter of direct concern to refinery operators and the entire petroleum industry.

Refinery Runs Reach 5,000,000 Bbl. Daily, New Peacetime High

UNDER the stimulus of continued record-breaking postwar demand for the entire range of petroleum products, refinery runs have passed the 5,000,000-bbl. daily mark for the first time in the nation's peacetime history.

The weekly report of the American Petroleum Institute shows runs at an even 5,000,000 bbl. daily and the refining industry operating at 89.2 per cent of capacity in the week ended May 31. Runs have shown a steady increase since this year's low of 4,772,000 bbl. daily in the week ended April 5.

The performance of the refining industry is even more significant in view of the fact that some 90,000 bbl. daily capacity is now shut down because of strikes in Pure Oil Co. plants at Toledo, Ohio, Smiths Bluff, Tex., and Cabin Creek, W. Va. Some of this loss, it has been pointed out, has doubtless been made up through processing arrangements.

Only once previously did the industry raise its runs above 5,000,000 bbl. daily. The week ended August 4, 1945, in the closing days of the war, runs averaged 5,077,000 bbl. daily. They climbed to 5,140,000 bbl. daily in the week ended August 18. Peace brought a continued sharp decline, and in October 6, during the widespread oil-industry strike, runs fell to a low point of 3,409,000 bbl. daily.

Gulf Coast Shows Major Gain

An analysis of the A.P.I. reports by districts reveals that, in comparison to runs early in April, increases on the Texas Gulf Coast can be credited with most of the 5,000,000 bbl. daily total the week ended May 31. In that area—the nation's largest refining region—runs the week ended May 31 were 1,163,000 bbl. daily, up 84,000 bbl. over the total for the week ended April 5.

East Coast refineries are reported running 832,000 bbl. daily, operating at 101.8 per cent of capacity. This is an increase of 52,000 bbl. daily over April 5. In California, refineries are running 856,000 bbl. daily, up 32,000 bbl. daily over the April 5 figures.

Indiana, Illinois, and Kentucky refinery runs are listed at 797,000 bbl. daily, off 2,000 bbl. daily from the April 5 figure and only 11,000 bbl. daily over the total of a year ago. Here the industry is operating at 86.7 per cent of capacity.

The figures for this area reflect the fact that many refineries are now at 100 per cent or higher of capacity and others are unable to bring more crude into the area under economical conditions. They also indicate the necessity of moving more products into this north-central area where supply problems are expected to be most acute during coming months.

Follows Production Trend

The increase in nation-wide crude runs follows the rising trend of crude production. The nation's output went above 5,000,000 bbl. daily the first time the week ended May 10, and, according to The Oil and Gas Journal's tabulation, was 5,077,140 bbl. daily the week ended June 7.

Crude stocks have pointed sharply upward in recent weeks and were 239,370,000 bbl. May 31. Part of this increase is due to storage of crude which ordinarily would have been processed in now strike-bound plants. Products stocks have been steady except for gasoline which is showing seasonal decline.

The record-high refinery runs reached the week ended May 31 bears out the forecast made late in April by the economics advisory committee of the Interstate Oil Compact Commission. The committee said 4,980,000 bbl. daily runs are needed the second quarter, 5,015,000 bbl. daily the third quarter, and 4,972,000 bbl. daily average for the year.

Arguments Heard in Suit To Dissolve Cooperatives

ORAL arguments in a move by the State of Kansas to dissolve Consumers Cooperative Association, revoke its charter, and force it into receivership were heard June 6 in the Kansas Supreme Court in Topeka.

Although Chief Justice W. W. Harvey made no announcement following the hearing, it was expected an opinion might be handed down July 12.

Proceedings against the Cooperative were filed April 8 after the State Charter Board refused to authorize the cooperative to increase its capitalization from $2,000,000 to $12,000,000. The cooperative countered with a mandamus action against the board.

Atty. Gen. Edward F. Arn charged in the hearing that C.C.A. has outgrown its organizational purpose as a farmers' cooperative, now having invested more than $20,000,000 in oil refineries, pipe line, drilling wells, acreage, royalties and leases, lumber mills, printing plants, and other industries.

Cities Service $23,698,000 Expansion Authorized

WASHINGTON.—The Federal Power Commission has authorized Cities Service Gas Co. to construct facilities to meet increased demands on its entire system, particularly in Kansas City.

Cities Service Gas' original application was filed more than a year ago. It included a 405-mile line from a new 12,000-hp. compressor station and dehydration plant north of Hugoton, Kans., to near Kansas City, Mo.; about 33.5 miles of 16-in. loop from Cotton Valley measuring station, Washington County, Oklahoma, to a point in Craig County, Oklahoma; a 1,610-hp. compressor station north of Leavenworth, Kans., and an additional 230-hp. compressor at the present Lyons, Kans., station.

A few weeks ago, the company filed an application for $1,490,683 alternate construction, declaring that the shortage of pipe would prevent completion of the Hugoton line for the coming winter and that there is "no assurance" the project could be completed before the winter of 1948-49. The alternate construction would allow the company to take additional supplies into its system in Oklahoma.

Industry Executives Named To Military Advisory Board

Appointment of 15 executives of the petroleum and natural-gas industries to act as a military petroleum advisory committee has been announced by Secretary of the Interior J. A. Krug.

Krug said the committee will provide the Army-Navy Petroleum Board and the Oil and Gas Division of the Interior Department with expert counsel on oil and gas matters relating to national security. The committee is scheduled to hold its first meeting June 16.

Members are:

Paul G. Benedum, Hiawatha Oil & Gas Co., Pittsburgh; T. E. Buchanan, The Texas Co., New York; Stewart P. Coleman, Standard Oil Co. (N. J.), New York; E. L. DeGolyer, DeGolyer & MacNaughton, Dallas; J. Terry Duce, Arabian-American Oil Co., Washington; R. G. Follis, Standard Oil Co. (California), San Francisco; B. I. Graves, Tide Water Associated Oil Co., New York; George A. Wilson, Interstate Natural Gas Co., Baton Rouge; D. B. Hodges, Shell Oil Co., Inc., New York; B. L. Majewski, Deep Rock Oil Corp., Chicago; R. L. Minckler, General Petroleum Corp., Los Angeles; J. Howard Marshall, Ashland Oil & Refining Co., Ashland, Ky.; J. R. Parten, Woodley Petroleum Co., Houston; E. E. Pyles, Los Angeles; and Bruce K. Brown, Standard Oil Co. (Ind.), Chicago; Charles L. Harding, Socony-Vacuum Oil Co., Inc., New York, has been designated legal adviser.

Vandenberg Proposes Amendments To Treaty; Hearings Recessed

by Henry D. Ralph

WASHINGTON. — Amendments to the Anglo-American petroleum treaty to meet objections of Independent producers and make it perfectly clear the treaty does not prohibit import restrictions or imply any regulation of the domestic industry were proposed by Sen. Arthur H. Vandenberg of Michigan, chairman of the foreign relations committee, just before the hearings were recessed for 2 weeks.

This proposal was interpreted as an attempt to clear away the doubts committee members obviously have regarding the treaty as a result of the criticisms leveled against it by opponents who have appeared to date. The Vandenberg amendments, in addition to the American Petroleum Institute reservations, would require British concurrence before the treaty could become effective.

The chairman proposed that the controversial Section C of Article II be changed to state that the domestic industry shall not be hampered by restrictions inconsistent with the provisions of Article I and Sections A and B of Article II. As it now stands this provides that the domestic industry shall not be hampered by restrictions inconsistent with the purposes of the treaty—a phrase which independent producers have said might be interpreted to mean almost anything.

The other amendment would apply to Section VII (B), which now reserves the right to enact laws regulating imports, and would add the phrase "or implying any commitment of any kind not so to act as either government in its discretion may see fit for the purpose of giving adequate protection to domestic industries."

Davies Supports Treaty

One of the chief witnesses in support of the treaty made statements which were turned into ammunition by the opponents. This was Ralph K. Davies, former deputy petroleum administrator for war, appearing in the capacity of special consultant to the secretary of the interior. He said the treaty would establish the open door principle, foster free trade, and discourage tariffs and exclusion of foreign oil. He may have been thinking more of the effect on British Empire countries, but independent producers claimed this supported their contention that the real purpose is to open the way for a flood of foreign oil into the United States.

Davies, who participated in its drafting and negotiation, went through the treaty a paragraph at a time to explain that it had no hidden meanings. He insisted it concerns only international trade and dealings between governments, and not oil produced and consumed domestically, and attempted to refute all arguments of opponents.

In this treaty the United States gives up nothing but gains much, while the British give up much, he said. Davies declared that the negotiators had a difficult time selling the treaty to the British but he did not anticipate that it would have to be sold to the American industry.

Says Independents Favor Treaty

Attacking the opposition, Davies said it is not true that most independents are opposed to the treaty, but on the contrary a majority of them favor it though some are indifferent because of their remoteness from international affairs. He flatly told the committee that the opposition is not coming from independents but from one major company, the Sinclair company, which for 2 years has been stirring up a "synthetic, artificial" opposition in many quarters.

George A. Hill, Jr., president of Houston Oil Co. of Texas, testifying in support of the Anglo-American agreement before the Senate foreign relations committee

Asked if the treaty should not be amended so that Article II would not apply to domestic activities, Davies said this was the heart of the treaty and it might as well be torn up without this. He explained that the principles of equal treatment and fair dealing must be applied at home as well as abroad and that the full effects of this provision will fall on the British and their colonies since the United States has no cartels or restrictive trade provisions.

Davies attempted to justify the treaty on the basis that the United States faces an oil shortage, but he also declared that we need more production in this country. This got him into a long colloquy with Sen. Henry Cabot Lodge of Massachusetts who argued that if we are running out of oil we should produce less and import more.

Senators Carl A. Hatch of New Mexico and Edward V. Robertson of Wyoming then asked if the treaty is designed to promote imports, and Davies agreed. He said it would not necessarily permit dumping and would not prevent Congress from imposing import duties but that it discourages tariff barriers and promotes the principle of free trade. He said our markets have always been open to the world and virtually agreed with his questioners that the treaty is an invitation to import oil.

Hill Strongest Witness

The strongest witness in support of the treaty was George A. Hill, Jr., president of Houston Oil Co. of Texas and one of the Government's advisers during the negotiations. Hill claimed credit for defeating the original draft and perfecting this one, and also for the reservations proposed by the American Petroleum Institute.

Hill said he does not agree with many of the interpretations placed on the treaty, and after repeated questioning he admitted that he did not agree with Davies as to its effect on imports and tariffs. He told the committee that the only way to make sure of the interpretations was to write it into the treaty, as in the A.P.I. reservations.

This led Chairman Arthur H. Vandenburg of Michigan to state that any reservations adopted by the committee would be incorporated into the text and require British acceptance, but he added that since two of the treaty's drafters differed on its meaning perhaps the text should be revised. The chairman said the committee's task is to resolve doubts that have been raised as to interpretation of the language, and he asked Hill to try to draft further language to do this.

Hill agreed with Davies that Article II is the heart of the treaty, explaining that the United States has

always followed the principles of the open door, free enterprise, equal competition, and noninterference in internal affairs of another country, but that the British have not and this treaty binds them to do so as regards the petroleum trade. He insisted that neither the federal nor the state government are doing anything in contravention of Article II and so there is no ground for the fears that this will interfere with the domestic industry.

In answer to questions from Sen. Tom Connally of Texas, Hill said that should any state enact legislation of the type prohibited by the treaty it would be unconstitutional and a nullity even without the treaty and could be attacked in the courts by any citizen without the intervention of the federal Government.

The term "equal opportunity" does not in any sense mean "free trade," Hill said in answer to Chairman Vandenberg, and in this treaty it applies to nothing but exploration and development rights. Hill also told the chairman he thought the majority of independent producers are not opposed to the treaty.

Holman Testifies Favorably

Eugene Holman, president of Standard Oil Co. (N. J.), also testified in favor of ratification.

The treaty is advantageous to the United States for three reasons, Holman said; it promotes private business under the competitive system, it establishes an advisory commission to talk over problems and collect needed international statistics, and it assists private companies in their dealings with foreign governments.

Another advocate was Joseph E. Pogue, vice president and petroleum economist of the Chase National Bank, New York, and also one of the advisers during negotiation of the pact. Pogue immediately tangled with Senator Connally by stating that the treaty was not well drafted and that the A.P.I. reservations were needed. The Texas senator jumped on the witness for doing a poor job, and with difficulty Pogue explained that the language was involved because of the attempt to meet all objections and interpretations.

Among those opposing the treaty as the hearings ended were J. E. McDonald, commissioner of agriculture of Texas; Max P. Zall, Denver attorney and independent producer; Warwick Downing, Denver producer; and Ghent Sanderford, Austin, attorney.

At the June 9 session Davies returned to the witness stand to correct what he said were misinterpretations of his earlier testimony. He said that when he told the committee the treaty guaranteed free trade and open markets he meant equal competition and nondiscrimination in trade within the country and not that the treaty would prevent limitation of imports or imposition of tariffs. He said the import policy of the United States was protected by the provision that the treaty is to operate within the framework of existing laws and also pointed to the express provision that the right to enact laws on imports is retained.

Referring to his earlier statement that we are in the midst of a serious oil shortage, Davies said he meant that consumer demand cannot be met from domestic production at the moment because most of our fields are operating at their maximum efficient rate of production and capacity cannot be increased until more steel is available. He said this means that we must find more oil but if we fail to find it we will have to depend more and more on foreign oil.

Under questioning by Senators Lodge of Massachusetts and Conally of Texas, Davies said the treaty does nothing toward establishing a national oil policy for this country, nor would any subsequent multilateral treaty. Both senators observed that such a policy should be fixed promptly and Davies agreed but said this involves many difficult questions and should not be done hastily.

Col. G. H. Vogel, executive secretary of the Army-Navy Petroleum Board, submitted a statement approved by the secretaries of war and navy recommending ratification because it will lead to exchange of international petroleum information, promote oil development in many parts of the world, protect United States foreign concessions which are important to the military in case of emergency, and promote the economic conditions of producing countries which will improve the availability of their oil to the United States when needed.

Stockpiling Urged by Military

Asked by Lodge if he opposed stockpiling oil, Vogel said it is vital to military policy to have reserves in the ground and producing capacity sufficient to supply military and essential civilian needs in time for war but that the policy of importing in time of peace was not a matter for the Army and Navy.

Russell B. Brown, general counsel of Independent Petroleum Association of America, presented the resolution in opposition to ratification adopted by I.P.A.A. last October. Vandenberg asked him if the entire opposition of independents did not rest on the famous Loftus-Rayner broadcast. Brown replied that there are other indications that the State Department is attempting to fix the Government's national oil policy and doing it without regard to the interests of domestic producers, and he feared that ratification of this treaty would make the department think it had even more authority.

Vandenberg remarked that he had read the broadcast, that it was "very silly" and he could well understand how it excited the anxiety of domestic producers, but he said it filters down what one or two officials hope to achieve by some future multilateral agreement, and that this bridge need not be crossed until we come to it.

Brown replied that the amendments proposed by Vandenberg plus the A.P.I. reservations would improve the treaty but he sees no real need for it and fears anything that would increase the authority of the State Department with respect to the domestic oil industry in the absence of a definite national oil policy set by Congress.

Hearings will be resumed in about 2 weeks at which time several spokesmen for Sinclair Oil Corp. and other opponents of the treaty will appear. *(For comments on the Anglo-American treaty hearings, see Watching Washington, page 78).*

Canadian Natural-Gas Output Shows Increase

Production of natural gas in Canada during the first quarter showed a marked increase, while production of crude oil showed an average drop of 2,444 bbl. daily, compared with the same period in 1946.

Natural-gas production averaged 194,157,000 cu. ft. daily, against 172,210,000 cu. ft. daily during the first quarter of 1946. March production averaged 178,003,000 cu. ft. daily, against 213,759,000 in February.

Production of crude oil averaged 19,269 bbl. daily during the first quarter, against 21,713 daily during the same period in 1946. March production averaged 19,422 bbl. daily, compared with an output of 19,804 bbl. daily in February.

Jersey Company Selling Kentucky Standard Interest

Standard Oil Co. (N. J.) is making arrangements to sell its entire interest in Standard Oil Co. (Ky.), about 9.35 per cent of the Kentucky company's total shares of outstanding stock, the company has announced. Kentucky Standard is a marketing company.

The Jersey company is searching every possibility to keep up with a record world-wide demand, Eugene Holman, president, declared at a recent stockholders meeting. The strain on the company's capacity, he said, is not resulting from a shortage of crude reserves, but on facilities and equipment to produce this oil, transport, refine, store, and distribute it.

this week

TREATY—Hearings on the Anglo-American agreements recessed for about 2 weeks by Senate foreign relations committee. . . . Committee appears sympathetic to arguments to opponents. . . . Senator Vandenberg proposes amendments making clear agreement does not prohibit import regulation or restrict domestic industry. . . .

INTERNATIONAL—E. DeGolyer, in talk in New York, revises upward reserve estimates for Middle East. . . . Places total at 26 to 30 billion barrels, says Kuwait reserves are more likely 9 billion instead of 4 billion barrels. . . . ¶C. S. Gulbenkian, minority partner in Iraq Petroleum, issues public statement through London attorneys, declaring present difficulties of company due solely to action of Jersey Standard and Socony-Vacuum. . . .

NATURAL GAS—Texas senate investigating committee reports state-wide proration of natural gas impractical due to the impossibility of storage and the lack of sufficient field pipe-line connections. . . . ¶Advisory committee of Louisiana Conservation Department meets in New Orleans to study plan for gas proration with indications rules will be written soon for six of the state's gas fields. . . . ¶FPC, industry, and state regulatory officials meet in Washington to discuss alleviating gas shortage. . . .

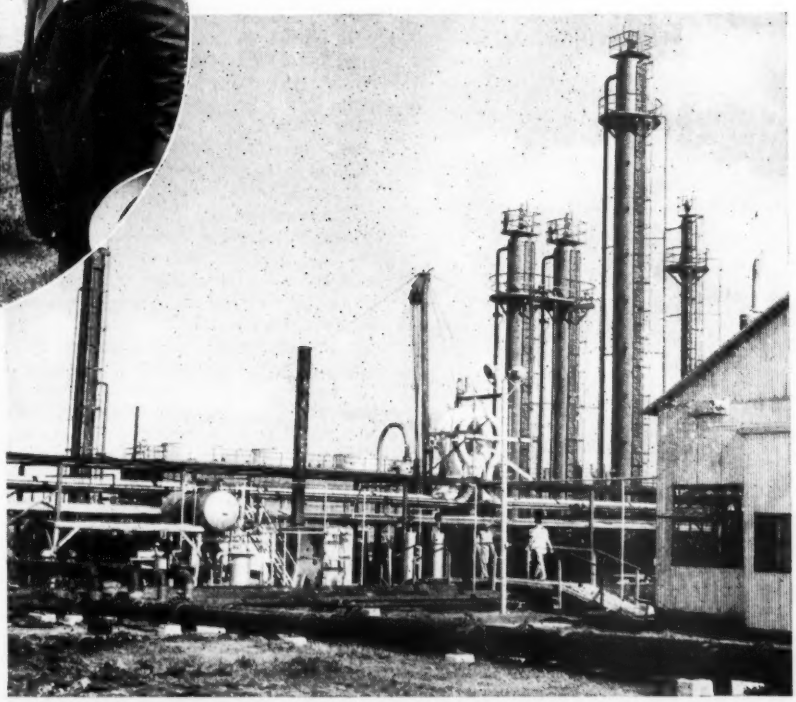
PIPE LINES—Stanolind nears completion of 178-mile 20-in. project looping crude line between Drumright, Okla., and Freeman, Mo. . . . ¶FPC authorizes Cities Service Gas project involving 404-mile 26-in. line from Hugoton to Kansas City. . . . ¶Colorado-Wyoming Gas Co. prepares to build 11 1/2 miles of 16-in. to use as high-pressure gas storage of approximately 5,000,000 cu. ft. . . .

LABOR—N.L.R.B. rejects petitions of C.I.O. Oil Workers Union for nation-wide bargaining with The Texas Co. and two affiliates. . . . Board decision says single unit would be inappropriate to the company's operations. . . .

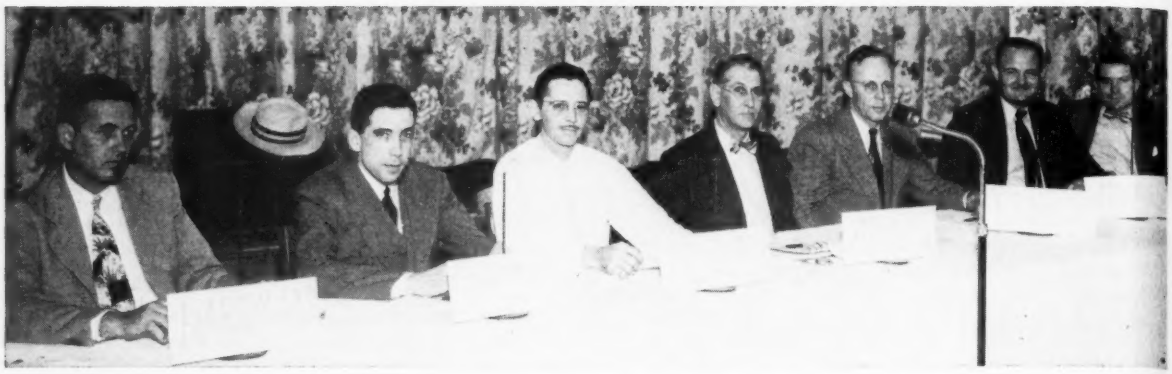
DEEP DRILLING—Superior of California 51-11 Weller, world's deepest well, now below 17,774 ft. . . .

PRODUCTION RECORDS—Texas production boost of 62,100 bbl. to 2,288,950 bbl. daily, a new record for the state, puts nation's production total at a new all-time high of 5,077,140 bbl. . . . ¶Runs to stills of 5,000,000 bbl. sets new peace-time high—140,000 bbl. below all-time high in August 1945.

EXPLORATION—Sun's new Hackberry sand pool opener in Orange County, Texas, flows 178 bbl. of 34°-gravity oil. . . . ¶Stephens County, Texas, test gets Mississippi lime production at 4,524-34 ft. 8 miles south of Woodson field. . . . ¶San Augustine County's prospective discovery north of San Augustine flows 82 bbl. of 42°-gravity oil, no water, in 24 hours, through perforations at 8,130-60 ft. . . . ¶Leduc field, Alberta, reports fourth producer. . . .



Praised by E. O. Thompson, chairman of the Texas Railroad Commission as a "complete example" of the state's efforts to conserve gas now being flared, this new gasoline plant was placed in operation June 3 near Vanderbilt in Jackson County. A Magnolia Petroleum Co. project, it has a capacity for processing 25,000,000 cu. ft. daily of casing-head gas from West Ranch field. Inset picture shows R. M. Chan, Magnolia vice president, receiving the congratulations of Thompson; center is E. E. Campbell, company natural-gas superintendent in the Vanderbilt district



Shown here is the 7-man discussion panel at the W.P.R.A. regional technical meeting in Wichita. Members of the group are: B. F. Hartman, Socony-Vacuum Oil Co., Inc., Augusta, Kans.; Davis Read, Universal Oil Products Corp., Chicago; Carl W. Berger, National Cooperative Refinery Association, McPherson, Kans.; H. L. Bedell, Socony-Vacuum Oil Co., Inc., Augusta, Kans.; R. W. Kelly, Dearborn Chemical Co., Tulsa; Hugh Neal, Phillips Petroleum Co., Bartlesville, Okla.; and George Kelso, Houdry Process Corp., New York

Catalytic Cracking Arouses Top Interest at W.P.R.A. Meeting

by R. B. Tuttle

WICHITA.—Of the several questions submitted to the seven-man panel at the June 6 regional technical meeting of the Western Petroleum Refiners Association here, the two concerning specifically catalytic cracking appeared to arouse more interest than any of the others dealing directly with refinery operations. Although discussion on delayed coking and viscosity breaking came in for a good share of discussion time, interest in these two subjects did not equal that shown in catalytic cracking when evaluated on a basis of panel and audience participation.

In the discussion on processing methods for preparing feed stocks for catalytic cracking, the panel agreed generally on the economics of three different methods. Vacuum flash, under current conditions of operation in the normal refinery, was shown to be favored from a standpoint of economics. This type of unit, on a 3,000-bbl. rating, was estimated to run to $100 per barrel on installation costs and from 5 to 7 cents per barrel operating cost. On the same basis propane deasphalting was given at $130 per barrel for installation and approximately 10 to 14 cents or twice that of vacuum flashing for operation. Coking was placed at $300 installation and 20 to 25 cents per barrel on operation cost.

The question on the economics of converting a two-coil thermal cracking unit to catalytic cracking brought out the statement that conversion may be made for upwards of $100 per barrel for a refinery in the 15,000-20,000-bbl. crude-charging range. For this conversion all thermal cracking equipment and the refinery's gas-recovery unit was to be used. The figure of $100 per barrel for the conversion was based on an investigation in which all of the various catalytic cracking processes were included.

Water Conditioning Discussed

Water conditioning for both boiler feed and cooling purposes came in for relatively wide discussion. Opinions indicated preference for internal over external treating methods for general conditions. For specific cases all factors, including over-all operational characteristics of the given refinery, should be evaluated to determine which chemicals should be employed in processing cooling and boiler feed water, it was advised by the panel's water conditioning authority.

A question concerning the type of metal to be used for lining a topping tower subjected to HCl and H_2S corrosion brought out the experiences of one panel member. For the particular tower stainless steel was used to line the vessel's lower and middle sections up to a point where water condensation began. Above the water condensation point and to the top of the tower manel was used as the liner.

The next scheduled W.P.R.A. technical meeting is set for July in Alma, Mich. Included in the program is a visit to the Leonard Refineries, Inc., plant at Alma.

Supreme Court Holds U. S. Owns Wyoming Section

WASHINGTON. — The Supreme Court has decided the federal Government rather than the State of Wyoming owns title to Section 36, Township 58, in Park County, but has ordered its special master to reopen the case to determine how much money the Government can collect from Ohio Oil Co. for producing oil there under state lease.

Wyoming claimed it owned the section as school land even though it was included within the boundaries of a naval petroleum reserve. The Supreme Court ruled that it could not claim title until it had been surveyed, which was not done until 1916. The reserve was created in 1915, and the state leased the land to Ohio Oil in 1917. The company drilled five wells and produced oil valued at $168,000, but claimed its expenses were $47,000 greater than the income.

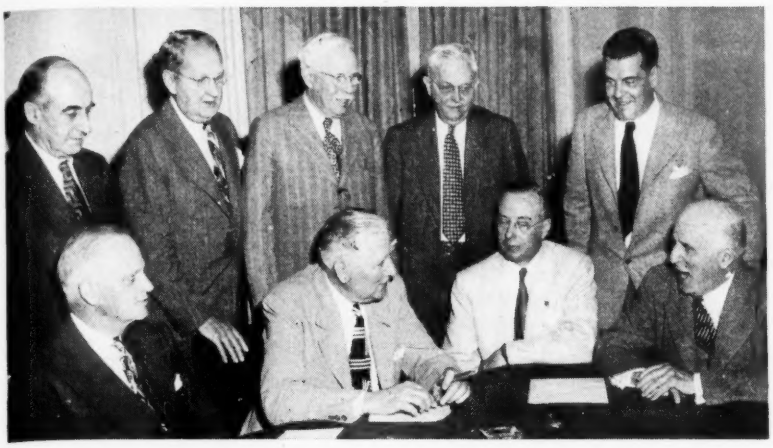
Controlling Interests in Eight Companies Bought

A deal involving the purchase for $5,000,000 cash of the controlling interests in eight companies owning 114 producing wells in East Texas field has been completed.

The properties were bought by Sol Brachman, Fort Worth, and Al H. Meadows and Joe A. Humphrey, Dallas, from T. P. Cannon and others of Henderson, Tex.

Companies in which the operators bought control are Unis Oil Co., Tres Oil Co., Pine Petroleum Co., Octo Oil Co., Falls Refining Co., Delano Oil Co., Bromley Oil Co., and Duo Oil Co.

The wells are on 40 leases in the Joinerville sector of the field and have an aggregate allowable of 1,818 bbl. daily. Included in the purchase were pipe-line gathering systems and storage facilities.



Reelected officers of the Pennsylvania Grade Crude Oil Association, shown at a directors' meeting following the association's twenty-third annual meeting in Pittsburgh, are: Sitting—George J. Hanks, president of South Penn Oil Co., Bradford, Pa., second vice president; D. T. Ring, Preston Oil Co., Columbus, association president; B. T. Haskins, Ebenezer Oil Co., Wellsville, N. Y., first vice president; and Fayette B. Dow, Washington, vice president and general counsel. Standing—H. A. Logan, United Refining Co., Warren, Pa., association director; Samuel Messer, Quaker State Oil Refining Co., Oil City, Pa., treasurer since the association's founding; C. L. Suhr, Pennzoil Co., Oil City, assistant treasurer; W. R. Reitz, Quaker State Oil Refining Corp., Oil City, assistant treasurer; and W. C. Wenzel, Oil City, association executive manager

Hallanan Says Industry's Greatest Drilling Program Under Way

PITTSBURGH.—In its effort to find and develop new sources of crude oil to satisfy record-high demand for petroleum products, the oil industry this year will drill the greatest footage in its history, W. S. Hallanan, chairman of the National Petroleum Council, declared here June 5 at the annual meeting of the Pennsylvania Grade Crude Oil Association.

Even the unprecedented drilling program now in progress will be inadequate, Hallanan asserted. Inability to obtain tubular and other steel material is preventing the industry from carrying out a program of a scope necessary to fulfill its obligation to the consumers.

"Records show we are sending to foreign countries more than four times as much welded and seamless pipe as we did before the war," he asserted. "Communist Russia alone has received in the last 20 months 50,000 tons of pipe, casing, and other tubular goods. . . . It is sheer folly to build up the war-making potentials of Europe at the expense of neglecting our own security."

"Our Government has asked us to cooperate in solving the various problems so vital to our national welfare," he continued. "There are those in the industry—few in number but loud in voice—who counsel that we should turn our back upon plain responsibility to our country. This would be not only unpatriotic; it would be downright stupid. I cannot conceive of anything that would bring government control over the industry more quickly and more certainly than to refuse every proper or reasonable suggestion for cooperation with the Government in the promotion of public welfare."

Secondary-Recovery Research

Clay content of sands is important in secondary-recovery operations, Dr. Richard V. Hughes, Bradford, Pa., association director of production research, said in a talk at the meeting. Because of this factor, slightly acidic waters and natural brines would probably be more suitable than fresh waters as an oil-drive medium in flooding operations, he added.

Hughes asked that a broad view be taken of research in secondary recovery. Such an approach, he explained, might save from discard some ideas which at first glance may seem impractical. He said the association will continue its grant to Pennsylvania State College for study of the use of smokes to plug thief oil sands and the influence of capillary effects in water flooding.

Increased oil production from the shallow sands in West Virginia will depend more on use of secondary-recovery methods than on new pools discovered, or extensions of new pools, according to another speaker at the meeting, Dr. Paul H. Price, Morgantown, West Virginia state geologist.

Essential for increased production in the state, he said, are: passage of a law permitting and regulating water flooding; detailed study of individual pools; and agreements between operators that will permit operation of a whole pool or a convenient part of it as a unit. General indications, he continued, are favorable for production from deeper and old sands in the already-developed parts of West Virginia and also in the eastern and southern areas.

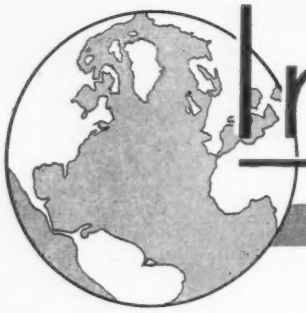
Identifying Oil Samples

Methods of identifying samples of oil from the Pennsylvania-grade area were discussed by Dr. Thomas C. Poulter, Chicago, associate director of the Armour Research Foundation. Pennsylvania oils contain olefins with an internal double bond showing under infrared spectrometer a characteristic band at 10.3 microns. Two other methods of identification, he said, are the refractivity intercept, depending on the paraffinic nature of Pennsylvania oils and a test employing solidification pressure which will detect the presence of as little as 5 per cent of other oils in a mixture with Pennsylvania grade.

In a discussion of the public-relations program sponsored by the American Petroleum Institute, Keeton Arnett, New York, vice president of the Fred Eldean Organization, Inc., told the Pennsylvania-grade association all business, big and little alike, has a stake in the issue of whether or not private enterprise can survive. The real question facing America, he continued, is: "Are we going to allow the planned-economy boys outsell us?"

Other speakers at the meeting were Dr. John W. Frey, Washington, director of the A.P.I. Marketing Division; Roy A. Foulke, New York, vice president of Dun & Bradstreet, Inc., and Charles J. Wood, Chicago oil marketer.

D. T. Ring, Preston Oil Co., Columbus, was reelected president of the association. Other officers also were reelected. Six new directors were chosen at the meeting. They are: D. S. Keenan, president, Carnegie Natural Gas Co., Pittsburgh; N. V. V. Munson, Franchot Estate, Olean, N. Y.; W. R. Reitz, Quaker State Oil Refining Corp., Oil City, Pa.; A. J. Saxe and John E. Selden, both of South Penn Oil Co., Bradford, Pa., and W. S. Zehrung, Pennzoil Co., Oil City. The board of directors voted endorsement of the oil industry's public-relations program.



International

WORLD-WIDE OIL DEVELOPMENTS

Russian Oil Program Termed Stupendous

RUSSIA'S program of rehabilitation and development of its oil and natural-gas reserves, a part of the current 5-year plan, is "a really stupendous undertaking," according to J. B. O'Connor, executive vice president of Dresser Industries, Inc., Cleveland, Ohio, who recently returned from an 8-week trip to the country.

"To understand it, one must bear in mind that the program embraces plans for the entire nation; that it is much larger in its potentialities than would be a similar program conducted by any one company in the United States; and that eventual possibilities are unlimited because of the vast reserves of crude which as yet have hardly been tapped."

O'Connor said the Russians are using the finest and most modern type of equipment. "As an example of modernization, in their cracking units, they are now replacing pumps of the horizontal reciprocating type by those of the centrifugal hot-oil type," he said.

"The Russians are determined to rehabilitate the fields destroyed during the war by clean out, repair, and new drilling."

Saratov-Moscow Gas Line

Of particular interest, O'Connor said, is the natural-gas pipe line between Saratov and Moscow. It is expected that the increased supply of natural gas to Moscow will relieve pressure on the railroads that are now overtaxed.

The Dresser executive said he inspected this pipe-line project and that he found it "a good job." One of the compressor stations, he added, is not only up to the latest American technical standards but is designed to operate in temperatures as low as 40° below zero.

During his trip, O'Connor negotiated the sale of a number of items of oil-industry equipment, including deep-drilling rigs which will be used in fields between the Volga and the Urals in the District of Kuibysheve, rigs and pumping units for rehabilitation of Maikop field, and a liquid methane plant to serve the Moscow-Saratov pipe line.

Peruvian Crude-Oil Production Declines

UNLESS Peru—the only oil-producing area on the west coast of the Americas, aside from California—steps up its current crude-oil production, industry sources believe this South American country will cease to be a petroleum exporter by 1953.

The only foreseeable event which might revert this change is the opening of the vast Montana region east of the Andes where petroleum geologists believe a vast potential in crude oil reserves exists. *(The Oil and Gas Journal, July 13, 1946, page 69).*

Indicative of declining domestic production is the fact that last year output dropped 1,292,237 bbl. (approximately 3,700 bbl. daily). Although a drop of 3,700 bbl. daily is relatively small compared with certain other countries, it represents a notable percentage in Peru when considering that that country's daily crude output was 40,000 bbl. daily just a few years ago and that last year's daily output was down to 34,100 bbl.

EXPORTS
(Figures in barrels)

	1945	1946
Crude oil	272,488	1,648,066
Gasoline	3,525,470	3,174,201
Kerosine	688,321	452,448
Diesel oil	977,257	810,876
Fuel oil	3,718,691	2,137,063
Lubricating oil	10,713	7,015
Others	20,727	14,151
Total	9,213,667	8,243,820

Coupled with Peru's declining petroleum production is an increasing consumption which in 1946 climbed to 375,000 bbl. over 1945. Exports dropped approximately 1,000,000 bbl. Consumption and exports, according to statistics of the U. S. Department of Commerce, for 1945 and 1946, are shown as follows:

PERUVIAN CONSUMPTION
(Figures in barrels)

	1945	1946
Gasoline	1,187,465	1,454,746
Naphtha	3,918	5,528
Kerosine	300,462	374,503
Diesel oil	86,721	125,350
Fuel oil	3,199,228	3,191,586
Lubricating oil	57,422	65,219
Grease	5,820	7,276
Liquefied gases	5,776	7,757
Asphalt	31,185	20,764
Total	4,877,997	5,252,729

Hungarian Communists Make Offer for Maort

DEPUTY PRIME MINISTER MATYAS RAKOSI, Russian citizen who has become virtual dictator of Hungary, has unsuccessfully attempted for the Communists to buy out Magyar Amerikai Olajipari Resventarsaag (Maort), wholly owned Hungarian subsidiary of Standard Oil Co. (N. J.), according to reports from Budapest.

Rakosi reportedly offered to pay "twice Standard's original investment" if the American concern would leave the country. The offer was refused, the report said, and Rakosi told that Standard had refused a German offer of $25,000,000 for the same properties at the beginning of the war. Reports also indicated American officials of the company had been threatened with banishment from Hungary.

Chief complaint of the Communists, according to reports, is that the Americans refuse to run the wells wide open to provide oil to meet immediate requirements. An American informant has indicated such manner of operation would ruin the field in about 2½ years.

Iranian Production Down

Crude-oil production in Iran totaled 1,378,000 tons (about 365,000 bbl. daily) in February, compared with 1,640,000 tons (about 396,774 bbl. daily) in January, according to figures from the Anglo-Iranian Oil Co., Ltd., the only oil producing company in Iran.

Russia Resumes Prewar Oil Trade With Britain

RUSSIAN OIL PRODUCTS, LTD., a distributing company in Great Britain which markets gasoline, motor oils, kerosine, and other petroleum products, plans to resume activities this month on its prewar basis. A tanker, which loaded approximately 94,500 bbl. of products at a Black Sea port, is now en route to Britain.

Before the war this company imported about 2,500,000 bbl. of petroleum products annually into British areas from Russia. Resumption of this trade is expected to save Great Britain about $8,000,000. This year close to 1,250,000 bbl. is expected to be sold in Great Britain.

With Russia badly in need of oil for her own internal use, it is difficult to understand why this move is being made, an oil man in New York observed last week, stating that possibly Great Britain, in exchange, will expedite the delivery of badly needed steel equipment to Russia.

Meanwhile, reports from the Moscow radio state the first of 100 scientific expeditions has begun a search for new oil fields in the Urals and the Turkmen Asiatic Soviet Republic. Other similar expeditions reportedly will set out for northern Sakhalin, Kamchatka, the Caucasus, and the Baltic republics. Tass, the official Russian news agency, has reported that large reservoirs of natural gas have been discovered in the Uzbekistan Republic in Soviet Asia.

In Washington, Sen. Owen Brewster said that he had a "reliable authentic report" that the Soviet Union was organizing "the greatest mineral drive ever conceived by the government and peoples of a single nation."

A report from Stockholm, quoting the Moscow correspondent of Svenska, states Russian oil men have discovered an extensive oil field on Kamchatka Peninsula and that the area is being developed.

Standard-Vacuum Renaming Three N. E. I. Affiliates

Names of Standard - Vacuum Oil Co.'s three operating affiliates in the Netherlands East Indies will be changed as soon as approval is obtained from the appropriate government authorities, L. W. Elliott, president, explained this week.

N. V. Standard-Vacuum Petroleum Maatschappij will be the new name of the company's principal producing and refining subsidiary, N. V. Nederlandsche Koloniale Petroleum Maatschappij.

N. V. Standard-Vacuum Tankvaart Maatschappij will be the new name of N. V. Nederlandsche Koloniale Tankvaart Maatschappij, which operates a fleet of small tankers, carrying oil products from the Palembang, Sumatra, refinery to markets throughout the Indies and to Singapore, Malaya, Indo-China and Siam.

The third company, which is incorporated at Batavia, Java, and which carries on marketing operations in the Indies, will be known as N. V. Standard-Vacuum Sales Co., instead of N. V. Koloniale Petroleum Verkoop Maatschappij.

Guatemala Increases Petroleum Imports

Value of petroleum imports into Guatemala rose to $1,995,906 last year, compared with $1,523,722 in 1945, according to the U. S. Foreign Commerce Weekly which gave import figures in the following volumes:

Gasoline, 219,438 bbl.; crude, fuel oil, 653,287 bbl.; diesel oil, 160,307 bbl; kerosine, 24,218 bbl.; and asphalt, paraffin wax, lubricating oils and greases, 4,264 metric tons (approximately 32,406 bbl.)

The local marketing affiliate of Standard Oil Co. (N. J.) reportedly hopes to have its new lighterage and storage facilities at the Pacific coast port of San Jose in operation by midsummer, thus eliminating the necessity of shipping petroleum products into Guatemala by rail from El Salvador.

Gain Shown in Uruguay's Crude Runs to Stills

In Uruguay, crude runs to stills rose to 2,504,000 bbl. (about 6,800 bbl. daily) in 1946, compared with 1,965,000 bbl. (about 5,300 bbl. daily) in 1945, according to statistics gathered by U. S. Department of Commerce.

Output of refined products, in barrels, was: gasoline, 781,553; aviation gasoline, 14,364; kerosene, 428,992; gas oil, 226,680; fuel oil, 894,896; diesel oil, 92,919; and turpentine, 1,178.

Sales of petroleum products during the first 9 months of 1946 were 2,777,000 (about 7,600 bbl. daily), compared with 2,484,000 (about 6,800 bbl. daily) in 1945. The 1946 sales comprised, in totals, gasoline, 579,146 bbl.; kerosene, 309,412 bbl.; gas oil, 128,375 bbl.; diesel oil, 98,740 bbl.; and fuel oil, 1,661,449 bbl.

Imports during 1946 comprised 1,854,222 bbl. of crude oil and 1,629,305 bbl. of petroleum products.

Iraq Refinery Bids Asked

WASHINGTON.—The U. S. Commerce Department has been informed that the Iraq minister of economics has asked invitations for bids for construction of the Baiji oil refinery with an annual capacity of about 600,000 tons (about 11,500 bbl. daily), to use oil from Kirkuk field of Iraq Petroleum Co., Ltd. Contract documents may be obtained from the Embassy of Iraq in Washington or the consulate general in New York. Bids are requested by November 26.

International

WORLD-WIDE OIL DEVELOPMENTS

Gas Development Project Being Studied in Italy

With an estimated natural-gas reserve, which is thought sufficient to yield 35,000,000 cu. ft. daily for 25 years, in Italy's Po River Delta, a $10,000,000 project is now under study by J. D. Creveling, American engineer, and Dr. Achille Bossi, Italian attorney and representative of the Italian - American Methane Society, according to the Foreign Commerce Weekly. The Italian press reports that Creveling stated this production rate could be determined within 18 months.

The plant calls for a compression plant at Rovigo and a network of pipe lines which will carry the gas to Milan and later to Verona, Bergama, and Brescia. Saving equivalent to 500,000 tons of coal reportedly would result from this project.

Colombian Public-Relations Program Recommended

Need to acquaint the public with the vital contributions being made by the petroleum industry is not limited to the United States, as shown by reports from Colombia that B. Herrera, former minister of labor, has advocated the development of an educational program to foster a better knowledge of Colombia's oil-industry operations.

Herrera suggested that seminars be established at leading Colombian universities. J. O. Bower, manager of Texas Petroleum Co., seconded Herrera's suggestion, saying that "a sound understanding of the oil industry is of the utmost importance."

Fuel-Economy Conference Scheduled for September

An international Fuel - Economy Conference, sponsored by the World Power Conference, will be held at The Hague, Netherlands, September 2-9.

Discussion subjects will include the production, distribution, and utilization of fuels of all types, with special emphasis given to wartime experiences and developments since 1939 or now in prospect. The program is being arranged in cooperation with committees of 33 member countries.

New Developments Indicate Scope of Vast Expansion Due in Middle East

by Warren W. Burns

SUPPORTING the well-known observation of E. DeGolyer that "the center of gravity of world oil production is shifting from the Gulf-Caribbean area to the Middle East," are the following late developments.

1. Definite plans for the 800-mile 30-32-in. crude-oil line of Middle East Pipe Lines, Ltd., from the Persian Gulf to the Mediterranean.

2. Programing of a third "big inch" Middle East pipe line, this from Iraq's Kirkuk field to the Mediterranean.

3. A long-term contract for the purchase of Gulf Exploration Co.'s crude oil from Kuwait by Shell Petroleum Co., Ltd.

4. Plans for spudding in five more wells in Kuwait.

5. Final settlement, in the near future, of Iraq Petroleum Co., Ltd.'s, new terms with C. S. Gulbenkian.

6. The latest indicated Middle East oil reserve figures—between 26 and 30 billion barrels—made by DeGolyer in New York.

7. Possible expansion of Near East Development Corp. to include more United States oil companies.

Middle East Pipe Lines, Ltd., 50 per cent owned by Anglo-Iranian Oil Co., Ltd. (a 56 per cent government-owned British firm), 40 per cent by Standard Oil Co. (N. J.) and 10 per cent by Socony-Vacuum Oil Co., Inc., probably will not see construction of its line under way before late 1949 or early 1950, because of the unavailability of steel pipe. However, surveys and estimates have been made, and an order already placed with Consolidated Steel Co. of California and National Tube Co. of Pittsburgh.

Up To 36-In. Studied

Exactly what the specifications of this line will be remains undecided, with either a 30-32-in. line, or a 34-36-in. line being considered. Whatever the decision, no pipe for this line will be fabricated until completion of Trans Arabian Pipe Line Co.'s 1,050-mile line, according to well-informed sources in New York.

Personnel of Middle East Pipe Lines, Ltd., have not been named nor have officers been appointed due to certain legal technicalities, but when these details are ironed out, it appears that C. L. Lockett, pipe-line expert with Jersey Standard, will hold a key position and it is likely that the company's head offices will be in New York.

Originating at the head of the Persian Gulf, possibly Basra, this line will carry Iranian crude and have a feeder line from Kuwait, Kuwait Oil Co., Ltd., is jointly owned by Anglo-Iranian and Gulf Exploration Co., a subsidiary of Gulf Oil Corp. The Mediterranean terminus has not yet been decided on, the location depending a great deal upon the political situation in that area. As the company does not yet have any official status, it has been impossible to approach certain Middle East governments for necessary right-of-way. Several months ago, studies were made on a joint right-of-way with the projected trans-Arabian line *(The Oil and Gas Journal, February 15, page 62)*.

Jersey Standard and Socony-Vacuum's recently announced plans to purchase crude oil from Anglo-Iranian over a 20-year period possibly will be realized before completion of the Middle East Pipe Lines, Ltd.'s line—if tankers are available—due to the increasing demand for more crude. Cost of the Iranian-Kuwait line will be upwards of $100,000,000.

The programing of a third Big Inch Middle East crude line, from Kirkuk field in Iraq to the Mediterranean, appears to stem from recent London negotiations by directors of Iraq Petroleum Co., Ltd. At present two 16-in. lines are being laid, paralleling existing 12-in. lines, from Kirkuk to Haifa, Palestine, and Tripoli, Lebanon. Upwards of 100 miles of the Kirkuk-Haifa 16-in. line have already been laid. Completion of this segment and the Kirkuk-Tripoli extension is not expected before 1949, at which time pipe-line capacity from Kirkuk will have been stepped up from 90,000 bbl. to approximately 280,000 bbl. daily. If and when a large-diameter line from Kirkuk is laid, possibly in the early 1950's, daily crude-oil production from Iraq—one of the richest of the Middle East oil nations—will far exceed 600,000 bbl.

DeGolyer's Remarks

Commenting on the oil reserves of the Middle East late last week in New York, DeGolyer, an internationally known geologist, said that he would revise his 1944 estimates made after his mission to that area for the Petroleum Administration for War. In Iraq, he said, indicated reserves are now 5 billion barrels, up 1 billion from his previous estimate. Elsewhere in the Middle East, DeGolyer said, developments over the past 2 years would show proved and indicated reserves of Iran from 6 to 8 billion barrels, instead of 5 to 6 billion barrels; Saudi Arabia from 5 to 7 billion barrels instead of 4 to 5 billion barrels; Kuwait, 9 billion instead of 4 billion barrels, and Qatar 1 billion instead of 500,000,000 bbl. Indicated reserves in Egypt, DeGolyer explained, are between 100,000,000 to 200,000,000 bbl. He later added the Middle East actually has been "very little explored."

Commenting on DeGolyer's reserve figures, F. Julius Fohs, a geologist well acquainted with that area who spoke on the same program at a New York University conference on the Middle East, stated that the probable crude-oil reserves there are 100 billion barrels and possibly 150 billion barrels. The largest area of "primary exploitable oil reserves," Fohs said, is held by United States oil companies.

Concession Possibilities Discussed in Capital

WASHINGTON.—Though no diplomatic assistance, formal or informal, has been requested, several United States companies have discussed with the U. S. State Department the possibility of obtaining oil concessions in the Middle East.

Department officials confirmed the discussions but declined to name the companies. It was learned, however, that one independent, Superior Oil Co. of California, has opened an office in Cairo. Unconfirmed reports said Sinclair Oil Corp. and Atlantic Refining Co. also may be interested.

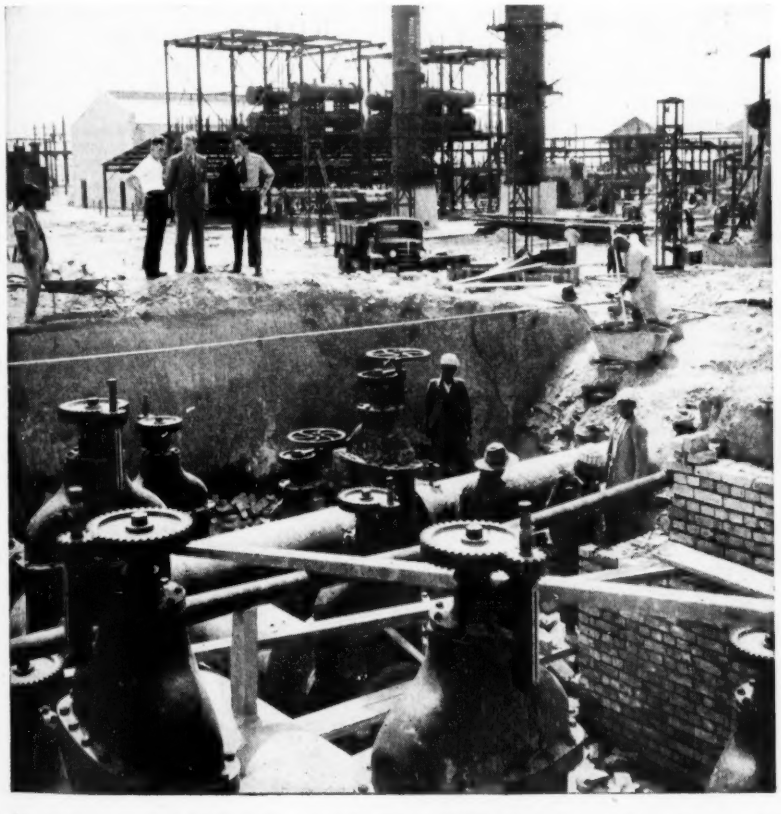
"Moreover," he continued, "there are sizable second and third-class areas, making a total of 975,000 sq. miles of exploitable territory for oil in the Middle East. "Primary oil areas" are estimated at 649,000 sq. miles; "secondary oil areas" at 131,000 sq. miles; and "tertiary oil areas" at 195,000 sq. miles.

Developments concerning Kuwait this past week were nothing more than has been expected in that Shell interests have been lifting Gulf's share of Kuwait crude for the past many months. However, J. F. Drake, president of Gulf Oil Corp., announced the signing of an agreement between Shell and Gulf "which is to continue for a long term." Just how long it was not revealed, but it was learned that Shell probably will not take all of Gulf's share after Kuwait production reaches some undetermined level. In April, Drake said that between 25 and 30 wells would be completed in Kuwait this year and more next. In line with these plans, 33 drillers and derrickmen flew from New York to Kuwait late last month. They were all from Texas and Oklahoma oil fields.

Kuwait's current 40,000-bbl. daily output is expected to be stepped up to 100,000 bbl. by the end of this year and to 160,000 bbl. daily by the end of 1948. Shell, presumably, will refine some of this crude at the Haifa refinery of Consolidated Refineries, Ltd., jointly owned by Anglo-Saxon Petroleum Co., Ltd. (Shell) and Anglo-Iranian. With a present rated capacity of about 90,000 bbl. daily, the Haifa refinery is slated to run more than 100,000 bbl. daily following completion of expansion plans. Shell is "to buy increasing annual quantities of crude to be produced in Kuwait over the period of the agreement," Drake explained. Some of this crude undoubtedly will be refined in Europe.

Reducing Imports From U. S.

In London, George Leigh-Jones, a managing director of Shell, said the products will be sold in sterling areas in Europe, Africa, and the Far East, as well as in Great Britain, resulting in a material reduction of United States imports. Eventually, he said, it is hoped that not only will Britain be able to reduce dollar expenditures by reducing United States imports, but that, as a result of the Gulf-Shell agreement, oil held by Shell in the Caribbean area will be sold to United States companies, thereby producing dollars.



The major expansion under way in practically all Middle East oil operations attests to the ever-growing importance of the area. Iraq Petroleum Co., Ltd., is now constructing a new 16-in. line to the Mediterranean from Kirkuk in Iraq and is preparing to step up exploration in several other countries. This view shows a manifold terminal being built at the I.P.C.'s new stabilizing plant at Kirkuk (Press Association photo)

International

Another Middle East development over the past week came when C. S. Gulbenkian, the 5 per cent stockholder in Iraq Petroleum Co., Ltd., issued a statement in London in which he charged Jersey Standard and Socony-Vacuum with being "solely" responsible for the "present difficulties" resulting in delay of consummating the expanded partnership arrangement with Arabian American Oil Co. Last week the two United States oil companies explained that the basis for a new agreement with I.P.C. partners had been reached with all partners except Gulbenkian.

Actually, however, Gulbenkian's basic disagreement with the two United States oil companies, which are I.P.C. partners through their jointly owned Near East Development Corp., reportedly is over a financial settlement.

In the London statement (Gulbenkian lives in Lisbon), his lawyers said: "Gulbenkian has sought to find common ground with his other partners for the future of the company, but so far no proposals have been put forward which are fair to him, although negotiations are proceeding."

Concerning possible expansion of Near East Development Corp., it has been learned on excellent authority that this is more than a mere rumor.

With present day developments to strengthen the hand of the United States in the Middle East, it appears that Jersey Standard and Socony-Vacuum, as well as the U. S. State Department, look favorably on increasing the number of partners in Near East Development. Gulf and Tide Water Associated Oil Co. are the companies most prominently spoken of as possible partners.

Steel Probe Committee Scheduled to Report

A special committee appointed by B. A. Hardey, president of the Independent Petroleum Association of America, to study the steel supply situation as it affects the petroleum industry was scheduled to report on its findings Thursday in Dallas at a joint meeting of leaders of the I.P.A.A. and the American Association of Oilwell Drilling Contractors.

The group is headed by J. Ed Warren, Midland, Tex. Creation of the committee was authorized by resolution at the mid-year meeting of the association in Jackson, Miss., May 8-9 at which export of steel products in the face of a domestic shortage was criticized.

WASHINGTON WATCHING

BY HENRY D. RALPH

Unfavorable Treaty Outlook

WASHINGTON. — If the Anglo-American petroleum treaty is not dead, its life is hanging by a very slender thread, to judge from the going over it has been getting by the Senate foreign relations committee.

No member of the committee appears to be very enthusiastic about it, some appear openly hostile, and all are quite critical. The government witnesses, for the most part, did not seem to impress the committee with any great need for the pact. They left the impression that it would be a nice thing, a desirable statement of principles, a help in settling problems involving the two governments. But they cited no specific examples.

On the other hand, the committee appeared to give little weight to some of the extreme contentions of opponents to the effect that the treaty would ruin independent producers and the Texas school system, substitute complete federal control for state regulation of the industry, or close down domestic production and flood the country with imports.

Different Interpretation

However, the committee is obviously quite concerned over the fact that different persons read different interpretations into the treaty. It seems safe to predict that the treaty will never be ratified, perhaps never get out of committee, unless and until there are new reservations which are given the same interpretation by everyone, or at least by all its supporters.

Ironically, the cause of the treaty has been done the most damage by those who are most anxious to have it ratified. Ralph Davies, who was never at his best sparring with congressional committees during his war-service days, ruined the effects of a carefully prepared analysis of the document by dragging in an alarm that we are running out of oil and advocating unlimited, duty-free imports.

And, it was made plain by many opponents, the real opposition began with the famous broadcast last fall by John Loftus and Charles Rayner of the State Department. So many witnesses referred to this broadcast as uncovering the real intent and as leading to the A.P.I. reservations and withdrawal of IPAA support, that Senator Lodge asked to have the broadcast made a part of the record. Chairman Vandenberg observed that the committee certainly will have to look into the broadcast.

"And into the broadcasters," wryly added Senator Connally.

The Committee Members

AN observer of the foreign relations committee during the oil treaty hearings quickly got the impression that every committee member who participated in questioning is highly critical of the document, but for various reasons.

Chairman Vandenberg, to judge from his questions, favors the general idea of international cooperation and harmony but has doubts that the language is clear and concise.

Senator George of Georgia, recognized as the Senate's greatest authority on international law, raised points to suggest that he believes the federal Government may be bound to control the domestic industry in some way.

Senator Connally of Texas, champion of state rights, gave an attentive ear to all constituents who feared that the treaty would extend federal regulations and hamper domestic production. "Glittering generalities," he described the document, asking how there could be order in international oil trade without somebody doing the ordering. He expressed the view that if the treaty is as innocous as its supporters contend it will do nothing that the two governments and the oil companies operating abroad cannot and should not do anyway.

Lodge Expresses Fears

Senator Lodge of Massachusetts pursued a line of questioning all his own. Representing a consuming state and being much interested in military security, Lodge expressed fears that the treaty might prevent the United States from obtaining military oil reserves abroad, from enacting adequate conservation legislation, or from importing sufficient supplies.

At the other extreme were Senators Hatch of New Mexico and Robertson of Wyoming, both from interior producing states. Their questioning indicated a fear that the treaty would foster excessive imports and artificial curtailment of domestic production.

It should be said that the foreign relations committee includes some of the most able members of the Senate, and their questions were to elicit information and may not fully reflect their final convictions. All of them are more or less committed to a bipartisan foreign policy which includes friendly relations with England, but the Democratic members seem to be the most critical of this pact and the Republican majority is somewhat suspicious of the motives of the personnel of the State Department at the time the oil treaty was drafted.

The oil treaty may have strong friends on the committee, but if so they are keeping very quiet.

Clearing the Subsidy Books

A LAST chance to collect stripper-well subsidy payments has been offered by the Reconstruction Finance Corp. to crude-oil purchasers whose final payments have been held up because of "suspense items."

Subsidy payments were made only on proof that the producer or owner was paid the premium over the ceiling price, and often fractional royalty owners could not be located by the purchaser so RFC put these into a suspense account and withheld payment. These items range from a few cents to several hundred dollars.

In the hope of clearing these accounts off its books, RFC has now authorized crude purchasers to submit a supplemental schedule of suspense items, and to obtain subsidy payments for those items which have been paid since the program terminated. The new deadline is June 30 for most purchasers and July 30 for purchasers of Pennsylvania Grade crude.

Continued Tanker Inaction

PRESIDENT TRUMAN has again urged Congress to take speedy action to continue the authority of the Maritime Commission to operate Government-owned tankers in domestic and foreign services. The problem was discussed at a Cabinet meeting last week and presented to congressional leaders of both parties at a White House conference.

Present operating authority expires at the end of this month, and unless there is quick action the commission will have to lay up more than 200 tankers now operating in all oceans, many of them supplying outlying Army and Navy installations.

All members of Congress have also been sent a report of the Transportation Division of the American Petroleum Institute urging that government operation be continued until the current abnormal demand is over. It stated that about 25 per cent of the world's tanker fleet is involved

and that their withdrawal would mean acute shortages of supplies in many areas and make it impossible to operate all refining facilities at full capacity.

The primary reasons for the shortage in private tanker carrying capacity were given by the A.P.I. as follows: (1) The United States oil industry traditionally uses American flag vessels for domestic movements but foreign flag ships for international trade; (2) the industry has sufficient tankers for its domestic needs; (3) the foreign-flag tanker fleet was depleted during the war, and the Army and Navy have prohibited further transfer of tankers to foreign registry; (4) the shortage of foreign-flag tankers is temporary because some 150 tankers are being built in foreign ship yards and many of the current petroleum demands, such as for European rehabilitation, are abnormal and temporary.

Gas-Shortage Conference

THE shortage of natural gas in the Appalachian and Great Lakes areas next winter will be just as severe as last winter, it was agreed by the Federal Power Commission's advisory committee and representatives of state public-utility commissions meeting here last week.

The only additional supplies of gas will be the increased amount which can be put through the Big Inch system, and FPC is already at work allocating this among the many would-be purchasers. Last winter Big Inch delivered between 120,000,000 and 140,000,000 cu. ft. per day, of which 20,000,000 cu. ft. was allocated to the area served by Panhandle Eastern Pipe Line Co. and the balance divided on a percentage basis among distributing companies in the Appalachian area. The advisory committee has recommended that substantially the same allocation be used next winter, but that during the summer months the amount going to the Panhandle territory be cut about in half to permit Appalachian operators to fill reserve storage.

This proposal brought protests from representatives of western areas served by Panhandle, who feel that since Big Inch will deliver more gas next year their areas should get a proportionately larger allocation. FPC must make the final decision, but the situation is complicated by a number of factors. One is uncertainty as to the amount of gas Big Inch will deliver on any future date. The present operators, Texas Eastern Transmission Corp., promise to step up throughput to 250,000,000 cu. ft. per day by November 1 with the addition of three compressors already authorized under the FPC temporary certificate. Authority to install additional compressors doubtless will be given by FPC if it can be shown that the equipment can be procured and gas reserves are ample.

Another problem is the physical difficulty of diverting Big Inch gas to the Panhandle territory, since it must be done by displacement rather than crowding more gas into Panhandle's mains. Only a few cities served by Panhandle have physical connections with mains tapping Big Inch so that they could use this gas instead of relying on Panhandle.

It is probable that FPC will make no allocation beyond November 1 at the present, and will call another meeting in the fall to reexamine the allocation in the light of the conditions then existing.

Teapot Dome Deep Test

ONE deep test well will be drilled on the Teapot Dome naval petroleum reserve before it is abandoned and returned to the Interior Department for public leasing, under present plans of Commodore William G. Greenman, director of naval petroleum reserves.

The Navy has already expressed its willingness to give up Teapot Dome, but Congress has not moved to enact the necessary legislation. The plan now is to ask that such legislation be deferred until a well can be drilled through the Tensleep formation, probably to some 6,000 or 6,500 ft. Some production has been obtained from the Tensleep in near-by Salt Creek field, but the main purpose of the deep test is not so much the hope of finding a large producing horizon as a caution to be certain the Navy is not overlooking all possibilities and to avoid criticism that the reserve was surrendered without complete exploration.

An appropriation for this test probably will not be asked until the Navy has completed its current programs in its Alaska and Elk Hills reserves, which will take a couple of years.

Wheeler Resignation

FURTHER investigation of Arabian-American Oil Co. and its contract to supply Navy requirements in the Persian Gulf apparently will go over into the indefinite future.

Former Sen. Burton K. Wheeler has resigned as special counsel to the Senate war investigating committee after several weeks of preliminary investigation of the matter. His resignation was sent from South America where he said he would be detained for some time on business for another client. The resignation was accepted on the same day that President Truman signed a special resolution permitting Wheeler to serve as committee counsel while retaining his other law practice.

The committee indicated that it would not employ another special counsel but that the Arabian investigation would be handled by its new chief counsel, William P. Rogers, thus suggesting that the matter is somewhat dormant.

Down-Hole Drilling Unit Demonstrated

REPRESENTATIVES of the press were given a preview June 6 in Bartlesville, Okla., of the first working model of a new drilling method developed by A. Arutunoff, designer of the Reda submersible pumping unit and president of Reda Pump Co.

The method consists of drilling with an electric - motor - driven unit which is lowered into the hole by a power cable from an ordinary winch. The hole is filled with sufficient liquid to cover the drilling unit and a circulating pump, incorporated in the unit, circulates liquid through the bit and deposits the cuttings in a bailer which is also a part of the unit. The unit must be pulled once every 30-60 ft. of hole made to dump the cuttings from the bailer.

To date, only a working model has been constructed, and it has drilled 160 ft. of 6⅛-in. hole using an 84-ft. derrick in the yard of the Reda company in Bartlesville. During tests, the drilling unit made 28 ft. of hole per hour in shaly limestone. A standard, 17½ - hp., 3 - phase, induction - type Reda motor, as used in their pumping units, has been adapted for the equipment.

Arutunoff has given the name Electrodrill to his new development.

Electrodrill Corp. has been formed to handle the development and promotion of the Electrodrill and other inventions of Arutunoff pertaining to oil-well drilling and servicing. Besides Arutunoff, officers and directors of the new corporation are: Suren Arutunoff, vice president and director, Bert Sutton, Jr., secretary-treasurer and director, and J. Stewart Dewar, William F. Province, C. V. Sellers, Allan R. Shaw, and William J. Sherry, directors. *(A detailed technical article on the Electrodrill with drawings and photographs will appear in the June 21 issue of The Oil and Gas Journal.)*

Gulf Dynamiting Banned

Exploding dynamite on the floor of the Gulf of Mexico in offshore seismograph operations has been prohibited by the Louisiana Wildlife and Fisheries Commission. The action was taken after complaints from fishermen that the shots made craters which damaged their nets.

Texas Legislature Adjourns; Many Controversial Bills Killed

by Carl F. Hoot

DALLAS.—The Fiftieth Texas Legislature adjourned June 6 with a number of oil bills pending or stalemated. Among those failing to pass, and of particular interest to the industry, was the oil-unitization measure, which was killed by the house when it refused to accept the senate's latest amendments. This bill would have allowed the pooling of lands for cooperative development and operation of oil and gas fields. Members of the house agreed to send it to a conference committee between the two houses, but the committee failed to agree before the session ended.

Several versions of this bill had been tossed back and forth by the senate and house, with each tacking on its own amendments. Factions in both houses held it was controversial and invited prosecution under anti-trust laws. Supporters of the bill claimed it would be a boon to old oil fields, where secondary-recovery projects are needed, but major companies were afraid of it on the basis that a changed administration would bring prosecution for entering into joint projects.

Gas Bill Blocked

Other bills blocked or pending included Rep. C. S. McLellan's natural-gas gathering tax, estimated to bring $29,000,000 a year for the payment of higher teachers' salaries and for rural-road programs. The bill would have established a tax on gas gathered in Texas, with the exception of gas used for recycling projects; gas used for fuel in connection with plant or lease operation; gas lawfully vented or flared in the development of oil or gas fields; and gas used for carbon black. The house passed the measure but it never came up before the senate.

The De Novo bill, permitting appeals to the courts from Texas Railroad Commission orders, even if the commission's decision was supported by substantial evidence, originated in the senate but never got beyond it. A bill passed by the senate but killed by the house, would have permitted condemnation of directional drilling sites adjacent to river beds which had been leased for mineral development from the state. This was known as the well-site condemnation bill.

Two gas bills failing to pass were the gas-measurement bill, which would prescribe a definition of a "cubic foot of natural gas" for use in all lease contracts. This was passed by the senate but was not acted upon by the house. The gas royalty bill, which would include a one-eighth royalty on liquid hydrocarbons, as well as dry gas, was killed.

Measures Enacted

Major bills enacted into law by the legislature, affecting the oil industry, included Sen. Grady Hazlewood's bill to allow the use of sweet and sour natural gas, without prior extraction of the gasoline content, in the manufacture of carbon black. It also provides that carbon-black plants pay a price equal to that paid by gas pipeline companies.

A 12-month gas proration bill will give the Railroad Commission the right to prescribe allowables from Carthage field, Panola County, for a year in advance. These allowables could be exceeded during 6 months out of the year if a corresponding underproduction was obtained during the remaining 6 months.

Two coastal bills by Sen. Rogers Kelley extended Texas' jurisdiction over coast areas to the edge of the Continental Shelf, for an average of 65 miles offshore, and extended Texas county boundaries into the gulf. Both of these bills, however, will hinge on the U. S. Supreme Court's final deposition on the federal Government's control over tidelands.

Rep. Donald Markle's lease-extension law passed, permitting the state School Land Board to make all future oil and gas leases for the duration of production. Present 25-year leases can be renegotiated by the board on a life-of-production basis.

Engines With 12.5-1 Ratio Practical, S.A.E. Hears

FRENCH LICK, Ind. — High-compression automobile engines which will save the motorist one-third of his gasoline bill have been developed and proven practical in experiments, Charles F. Kettering, recently retired vice president in charge of research of General Motors Corp., declared before the summer meeting of the Society of Automotive Engineers here June 1-6.

General use of high-compression engines will come gradually and will follow much cooperative research work by fuels and engine manufacturers, Kettering said.

Six-cylinder engines with a compression ratio of 12.5 to 1 have been tested in automobiles to obtain experimental data, he said. At this compression ratio, he asserted, pressure on the piston is 1,200 psi., compared to a pressure of 600 psi. in present automobile engines.

An engine which would allow the doubled pressure and at the same time give smooth operation in an automobile chassis was developed, he declared, by building a very rigid engine structure, although not a heavier one.

"But these engines and fuel developments are in the laboratory stage," he said, "and how soon they can be incorporated in the automobile will depend upon . . . development by both the automobile and petroleum industries working toward a common goal."

The automotive industry will supply a higher-compression engine as the petroleum industry makes improvements in fuels. This process, he said, gradually will result in the introduction into general use of the high-compression engines.

Kettering Gets Degree

Charles F. Kettering Monday was awarded the degree of doctor of science at University of Michigan at Ann Arbor in honor of his great contributions to the science and development of the automotive industry.

The retired General Motors Corp. official is best known to the world for his development of the electric self-starter, invention of gasoline-engine electric-power plants, and for the discovery of tetraethyl lead, accomplished under his direction by the late Thomas Midgley and T. A. Boyd, now head of fuel research for General Motors' research laboratories.

Nationwide Bargaining Unit For Texas Co. Rejected

The National Labor Relations Board has rejected the petition of the Oil Workers International Union (C.I.O.) for nationwide bargaining with The Texas Co. and two affiliates.

In a significant decision, the board rejected the union's request for a ruling which would merge about 30 locals into a single, nation-wide bargaining unit.

Its decision said: "A single unit of employes would be inappropriate because it contravenes the existing organizational, functional, and geographic structure of the employers' operations."

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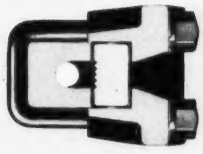

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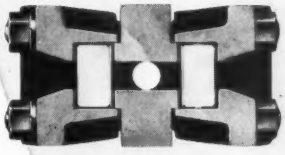

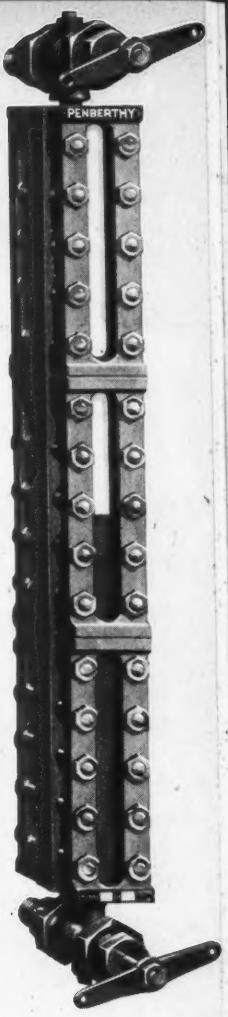

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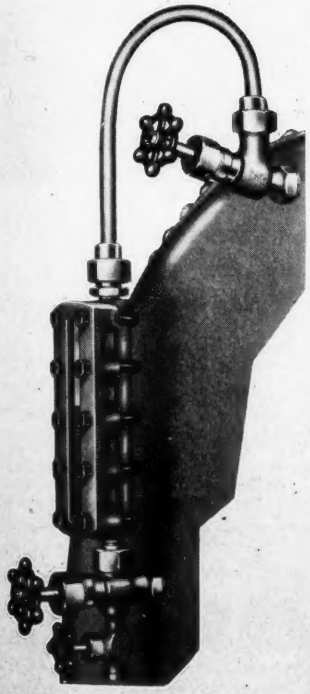

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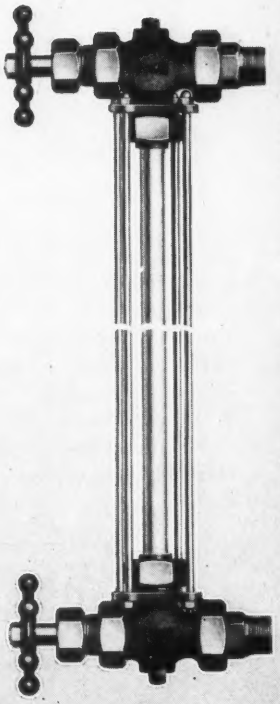

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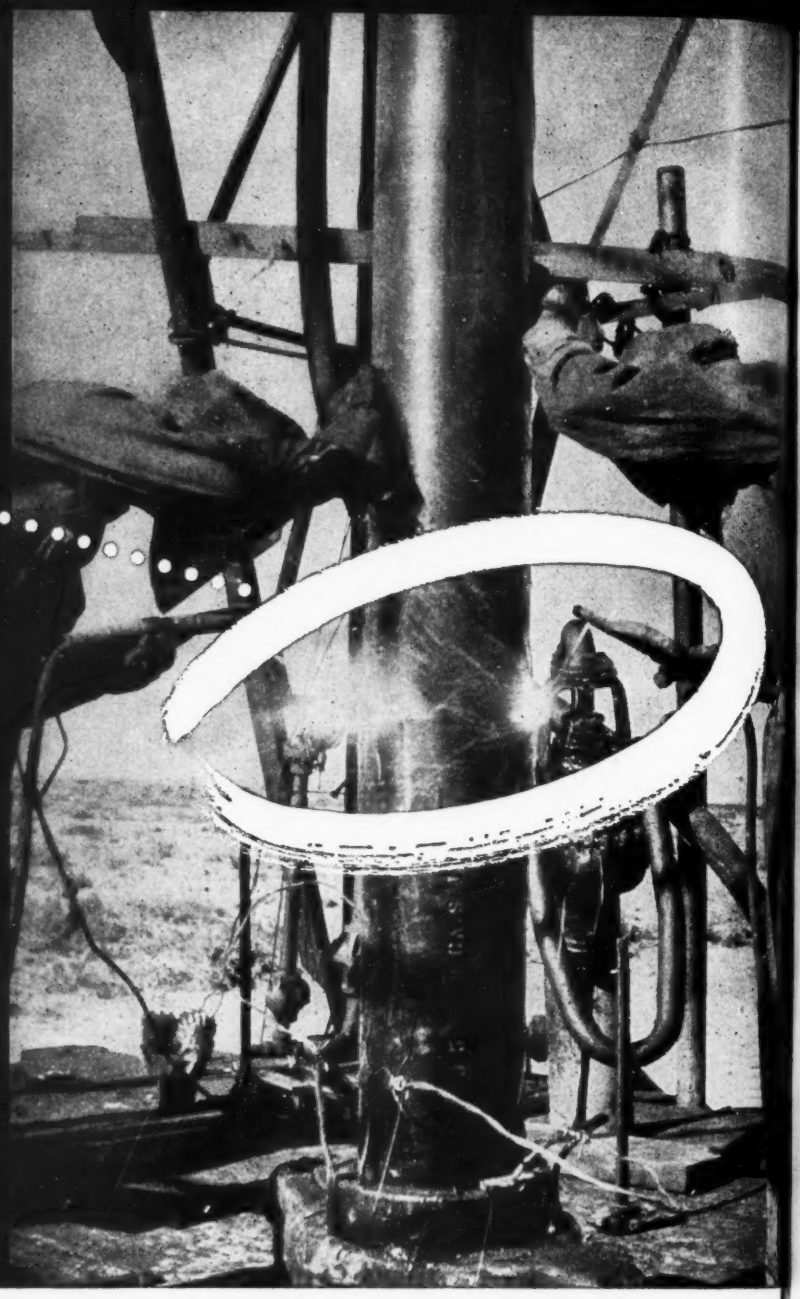

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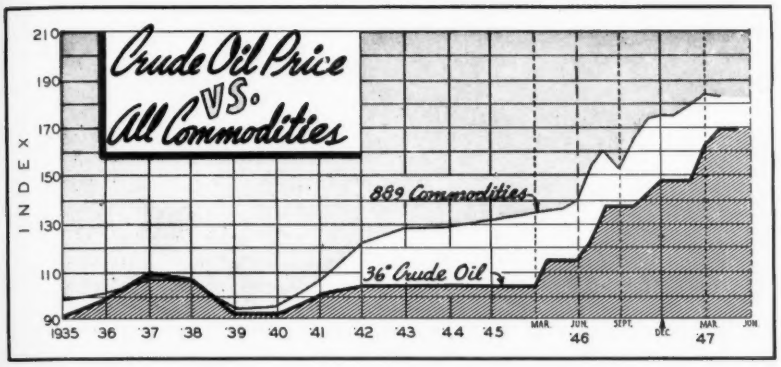
Petroleum, Products Still Cheap

by Charles J. Deegan

CRUDE oil and refined products, particularly gasoline, are still cheap compared to the prices of other commodities. The comparisons as shown in the accompanying charts are based on a 5-year prewar period that most of today's consumers remember and will accept as reasonably representative of normal price relationships. It is also a 5-year period recognized by the Government as the proper base period to use in computing its cost of living index. (This is technically called the "Consumer's Price Index," but has become widely known as the "Cost of Living Index").

These charts show how the price of crude oil was frozen during the war, while other commodities were permitted to rise. In the postwar period, after price controls were removed, crude petroleum and gasoline prices advanced rapidly. But even at today's prices, they still have not increased sufficiently to bring them into prewar parity with the prices of other commodities. The gap between crude prices and other raw materials is particularly noticeable.

The general public is more conscious of gasoline prices than of crude-oil prices. Hence the price of gasoline at the service station (exclusive of sales taxes over which the industry has no control), is compared with the Government's own cost-of-living index. Here too, the same trend is obvious. Retail gasoline prices, exclusive of sales tax, have not gone up as much as the average of other items that make up the cost of living.


Crude Oil Price VS. All Commodities
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889 Commodities
36° Crude Oil
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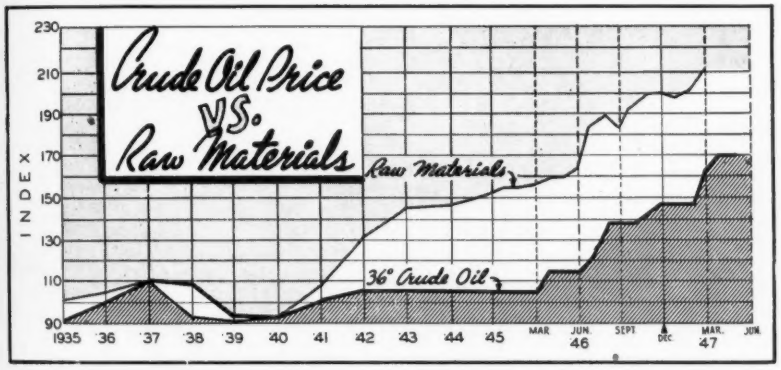
Crude Oil Price VS. Raw Materials
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Raw Materials
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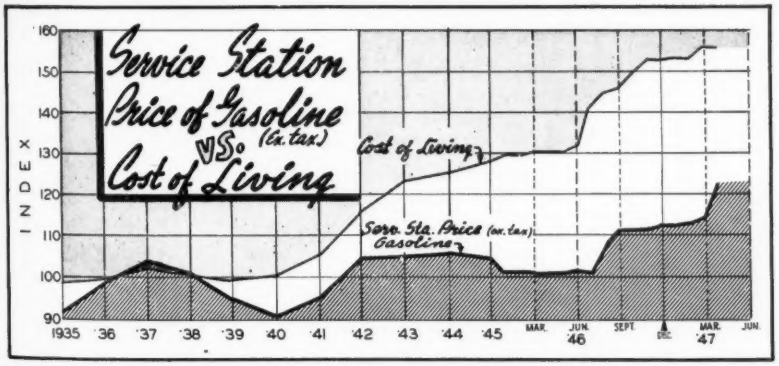
Service Station Price of Gasoline (ex. tax) VS. Cost of Living
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Cost of Living
Serv. Sta. Price (ex. tax) Gasoline
1935 36 37 38 39 40 41 42 43 44 45 MAR. JUN. SEPT. DEC. MAR. JUN.
46 47

Top: Comparison of Bureau of Labor Statistics' all-commodities wholesale price index and Mid-Continent crude-oil prices. Both converted to base period 1935-39 average price = 100. Middle: Comparison of Bureau of Labor Statistics' raw-materials wholesale price index and Mid-Continent crude-oil prices. Both converted to base period 1935-39 average price = 100. Bottom: Comparison of Bureau of Labor Statistics' consumers price (cost of living) index and retail price of gasoline (exclusive of sales tax) in 50 representative cities. Base period 1935-39 average price = 100 for both gasoline and cost of living

Ulrope Named District Public-Relations Head

L. E. Ulrope, Standard Oil Co. of New Jersey, was elected chairman of the New York-New Jersey district committee in the oil industry's public-relations program at a committee meeting June 5 in New York.

Quentin W. Regestein, Socony-Vacuum Oil Co., was elected chairman for New York, and Gordon Donald, Standard Oil Co. (N. J.), chairman for New Jersey.

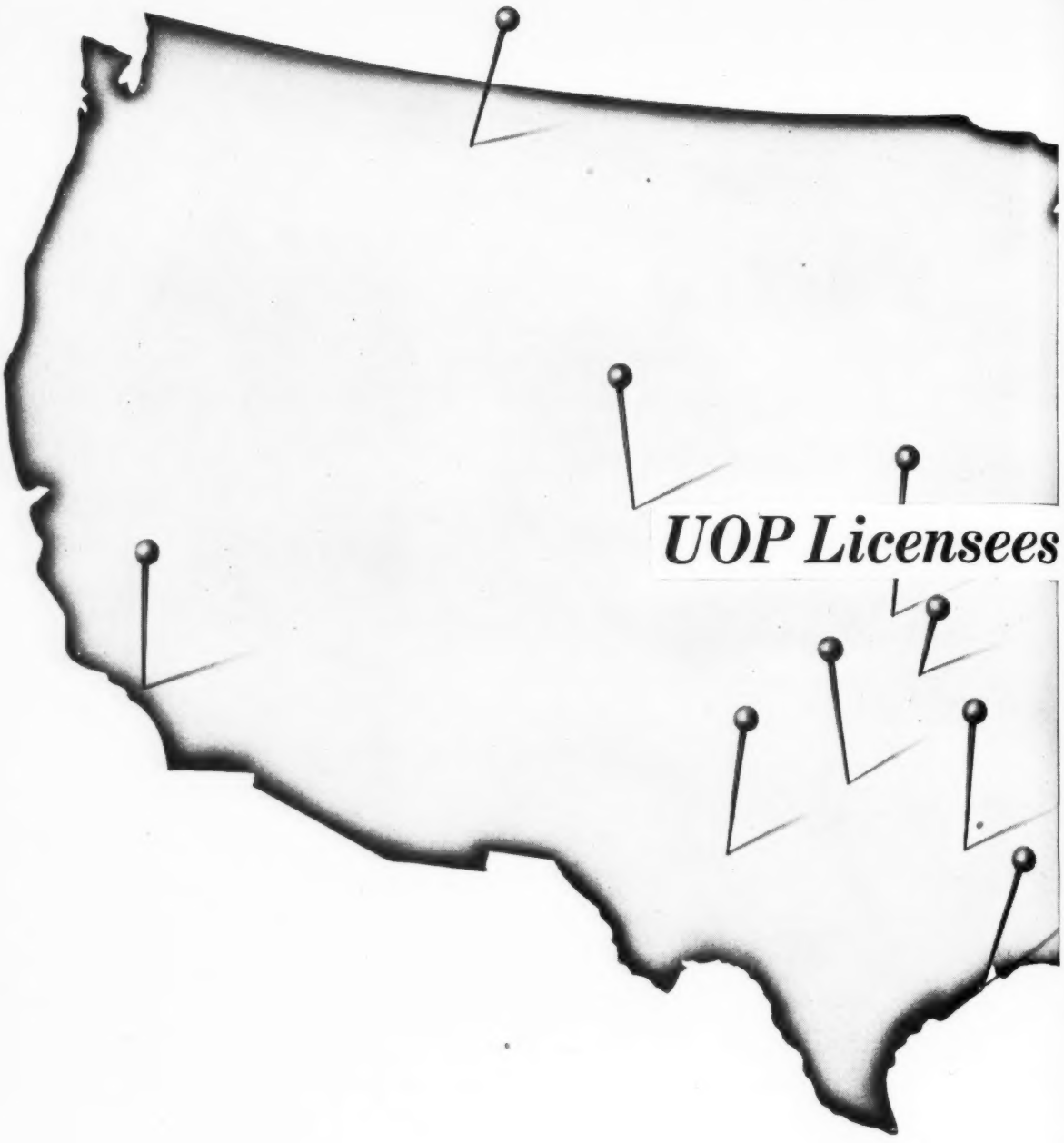
R. W. Parker, Jr., Hartol Products Co.,; D. W. Stewart, The Texas Co., and Wiley Butler, Coastal Oil Co., were named vice chairmen of the district committee.

In other public-relations program developments, O. E. Mitchell, vice president of the Texas Pacific Coal & Oil Co., was elected chairman of the Fort Worth sectional committee, and in Chicago the board of directors of the Liquefied Petroleum Gas Association at the group's annual convention adopted a resolution praising the petroleum industry for embarking on an aggressive public-relations program.

Cities Service Buys U. S. Tract Near Lake Charles

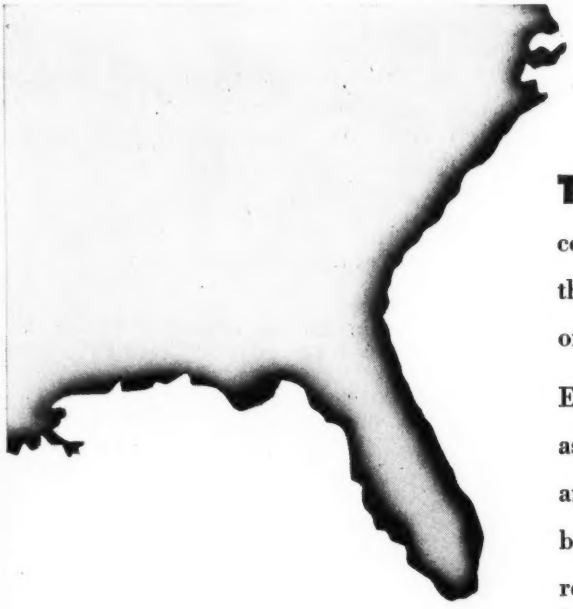
WASHINGTON.—Cities Service Refining Corp. has purchased for $121,100 cash a partially improved, 162-acre tract 5 miles south of Lake Charles, La., War Assets Administration has announced.

The tract was acquired by the Government at a cost of $475,391 as a site for a toluene plant, but the project was abandoned V-J Day. The tract is adjacent to a Cities Service refinery and near a Government-owned butadiene plant now being operated by Cities Service. It will be used as a site for new buildings to be erected by Cities Service in an expansion program.



UOP service engineers are stationed at these points: DENVER, COLORADO • WICHITA FALLS, TEXAS • ST. MARY'S, WEST VIRGINIA
TEXAS CITY, TEXAS • GRAND RAPIDS, MICHIGAN • BIG SPRING, TEXAS • CLEVELAND, OKLAHOMA • TYLER, TEXAS
LOS ANGELES, CALIFORNIA • DETROIT, MICHIGAN • WICHITA, KANSAS • GREAT FALLS, MONTANA • OIL CITY, PENNSYLVANIA

Placed the Pins on This Map



The location of UOP licensee refineries was carefully considered in stationing service engineers at these points. Result: UOP service within easy reach of every licensee.

Each engineer serves a minimum number of licensees, assuring a thorough knowledge of the problems and requirements of each . . . and making his own broad experience and UOP's facilities more readily available.

Licensee refineries are well aware of the part played by UOP service. They have seen its value demonstrated time and again in the efficient, economical operation of their plants and in the high quality of their products.

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PERSONALS

Veteran Engineer New United Gas Executive

M A. ABERNATHY, Shreveport, newly elected vice president of United Gas Corp., is an engineer of 31 years of experience and a veteran of 27 years in the natural-gas industry.

He was elevated to his new post from a vice presidency in United Gas Pipe Line Co., a subsidiary.

A native of Whitney, Tex., Abernathy obtained a degree in civil engineering from Texas A. & M. College, working for various railroads after his graduation as maintenance engineer, valuation engineer, and instrument man.

He joined Magnolia Petroleum Co. in Dallas as an engineer and land man in 1920.

In 1924 he became affiliated with Magnolia Gas Co. as superintendent of measurement and general engineering, and 6 years later when this firm became a part of United Gas Public Service Co., he was moved to Houston as general superintendent of pipe lines.

He was elected a vice president of United Gas Pipe Line Co. in 1937 and moved to Shreveport when the company's headquarters were established there in 1940.

L. Wilkonson, formerly a petroleum engineer with Stanolind Oil & Gas Co., has been appointed manager of Sunflower Natural Gas Co., a subsidiary of Spencer Chemical Co., Kansas City, Mo. Wilkonson will move to Wichita, Kans., where Sunflower Natural Gas is establishing an office, according to **L. H. Albus,** vice president.

Rex Townsend, formerly assistant chief of the petroleum division of the State Department, has joined the staff of Hoover, Curtice & Ruby, Inc., and United Engineering Corp., S.A.

Donald T. MacRoberts, engineer for the research department of United Gas Pipe Line Co., has been appointed director of research in the company's general offices in Shreveport.

Buell O'Connor, Stanolind Oil & Gas Co., has been elected chairman of the newly organized Tulsa section of the American Chemical Society. He has been serving as temporary chairman pending final organization of the group. Other permanent officers are **Dr. Paul H. Cardwell,** Dowell, Inc., vice chairman; **Walter Duncan,** Ozark Mahoning Co., secretary; **Harvey Phillips,** Mid-Continent Petroleum Corp., treasurer; **Phillip Blackburn,** Baroid, Inc., membership chairman; and **Burrell Logue,** The Texas Co., and **R. W. Provine,** Mid-Continent Petroleum Corp., national councilors.

C. M. Harris, R. W. Edmund, and **John Brewer,** who formerly operated as Harris & Edmund, consulting geologists, have joined Globe Oil & Refining Co. in the company's recently opened offices in Oklahoma City. **Grover Ledle, Jr.,** has been transferred from Wichita to become assistant landman in the Oklahoma City office.

Lewis M. Thompson, apprentice engineer in the Brownfield, Tex., area for Stanolind Oil & Gas Co., has been made junior petroleum engineer. Other Stanolind advances included **Cecil E. Jennings, Peter G. Burnett,** and **Zack F. Mitchell,** all of the Greggton, Tex., area, to junior petroleum engineers.

R. A. Coffey, Longview, Tex., oil operator, was elected governor of the 2-X District Lions International Club at the recent convention in Marshall, Tex.

N. Y. Ruth, head of the land department of Carter Oil Co., has been promoted to exploration manager. He will assume some of the work formerly directed by **H. F. Moses,** vice president in charge of exploration and research, and thus enable Moses to devote more time to executive duties. Ruth began work with Carter in 1927 in the geological department. **J. H. Marsh,** division landman at Oklahoma City, will replace Ruth as land department head in Tulsa.

John W. Jackson, for the past 11 years chief clerk and manager of Magnolia Petroleum Co.'s office at Olden, Tex., has been promoted to administrative assistant of the company's natural-gas department in Dallas. Jackson has been with Magnolia 28 years.

B. I. Graves, vice president of Tide Water Associated Oil Co., is now on an extended European trip inspecting the company's foreign marketing facilities.

John Irwin, president of Canadian Oil Companies, Ltd., has announced the following appointments: **W. Harold Rea,** executive assistant to the president, elected a member of the board of directors; **R. T. Eyre,** formerly operations manager, made vice president in charge of operations; **R. C. West,** formerly general sales manager, made vice president in charge of sales; **Douglas Robinson,** made secretary of the company but retaining his position of solicitor; and **H. F. Hoecker,** made manager of the newly created real estate department.

George W. Ray, Jr., former general attorney with The Texas Co., has been appointed general counsel for Arabian American Oil Co.

G. L. Rowsey, Harris A. Melasky, and **Glenn Forgan** have been elected to the board of directors of Petroleum Heat & Power Co. Rowsey is president and Melasky vice president of Taylor Refining Co., recently acquired by the Petroleum Heat and Power. Taylor Refining will continue to operate under its present officers and directors. Its activities, including production and transportation of crude oil, refining, and marketing will be handled from its general offices in Taylor, Tex.

A. Jacobsen, president of Amerada Petroleum Corp. with headquarters in New York, is conferring with Tulsa officials of the company. **E. H. McCollough,** vice president of the Amerada corporation in charge of the Los Angeles office, and **Cedric Boone,** head of land department activities in California, also are in Tulsa for the conference of officials and departmental heads.

Russell Smith has been named field geologist for Pure Oil Co.'s Michigan core-drilling program to succeed **Wil-**

How Arc Welding is Used to Beat the Pipe Shortage

BY
E. D. ANDERSON, WELDING ENGINEER
THE LINCOLN ELECTRIC CO.
KANSAS CITY, MO.

THE lack of new pipe did not prevent The Cities Service Gas Co. from constructing its 22-mile gas pipe line between Harrisonville and Independence, Mo. They used 12-inch pipe from old gas and oil lines, reclaiming it with arc welding.

The pipe sections, which vary in length from 20 feet to 30 feet, are first cleaned by machine-operated steel wire brushes. Then the pitted areas caused by corrosion are built up with "Fleetweld 5" electrode.

The pipe sections are joined by the usual roll-welding procedures. The sections are placed on rollers for easy turning. Welding is done in three passes with "Fleetweld 5", first a stringer bead with $\frac{3}{16}$" size electrode, then two passes with $\frac{1}{4}$" size. Units of three sections are welded in this manner in a central yard, hauled and strung on the line and "bell-hole" welded into the line and lowered into the trench.

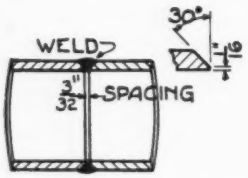

Fig. 3. Cross-section of the welded joint—plain end type without liner. Each end is bevelled 30° to make a 60° V.

Fig. 1 is a general view of a "bell-hole" operation. In the "bell-hole" welding two operators weld simultaneously, starting at top and working to the bottom. Close-up of this operation is shown in Fig. 2. Pipe is bevelled for a 60-degree V. The sections are then tack welded in correct alignment. Finish weld is made in three passes of "Fleetweld 5"—a stringer pass with $\frac{5}{32}$" size followed by two passes of $\frac{3}{16}$" size. The standard plain end joint without liner, sketched in Fig. 3, was used.

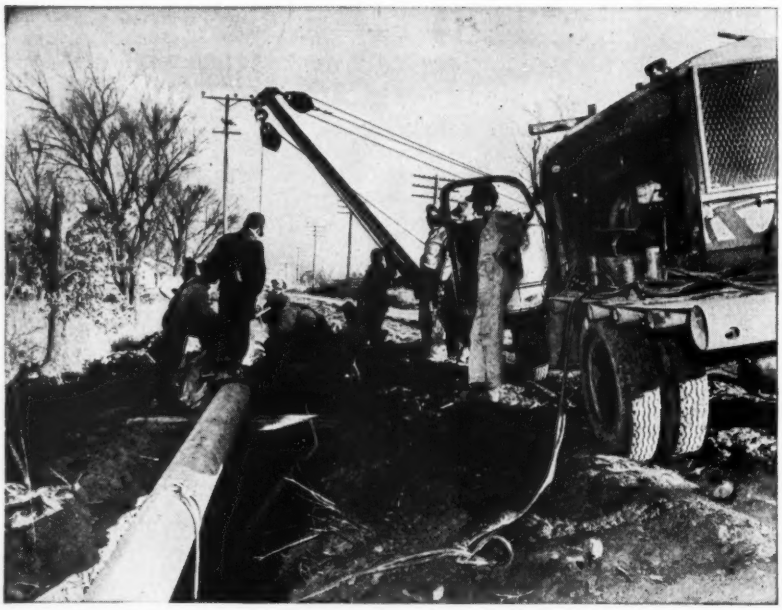

Fig. 1. "Bell-hole" welding on the Harrisonville to Independence pipe line.

Fig. 2. Two operators weld simultaneously in the "bell-hole" operation.

Complete procedures for the various methods of welding all types of pipe lines are given in Bulletin 418, available without charge from THE LINCOLN ELECTRIC COMPANY, Dept. 206, Cleveland 1, Ohio.

Advertisement

lard Sanger, who has been transferred to Newark, Ohio. Smith formerly served in the Illinois district.

Dr. James H. Boyd, former eastern representative in research and development for Phillips Petroleum Co., has opened offices at 19 Rector Street, New York, as a chemical consultant on technical and economic problems. He will specialize in the economic appraisal of chemical markets, patents, and projects in petroleum hydrocarbons, chemicals, and emulsion polymerization.

John Knox Smith has been appointed field engineer for the Liquefied Petroleum Gas Association. Until recently he has been safety engineer of the research and development departments of Phillips Petroleum Co.

Gordon Lepley, Atlantic Refining Co. production engineer at Magnolia, Ark., has been made district engineer at Odessa, Tex. Among other recent Atlantic Refining changes are a number of shifts in the Point Breeze, Pa., refinery. They include: **Robert B. Brown,** time-study engineer to safety consultant at company headquarters in Philadelphia; **Allen Cameron,** methods engineer to plant-standardization engineer; **Walter Lufkin,** time-study engineer to methods engineer; **Thomas A. Nupp,** plant standardization engineer to shop-mechanic industrial engineer; and **Cameron Schreiner,** day foreman to operating foreman. In the research and development organization, **Glenn P. Middlebrooks,** assistant chemical engineer, has been made associate chemical engineer.

Dr. G. E. Mitchell, formerly in the process-engineering department of Standard Oil Co. of New Jersey, Louisiana Division, has been named head of the operations-analysis group for the perbunan, steam cracking, dehydrogenation, and butadiene recovery units of the chemical-products division of the chemical technical-service department. **R. W. Benoliel** has been placed in charge of the loss-reduction and equipment-testing group in the division, and **E. A. Johnson** has been assigned to head the budgets and economics group.

Frank Phillips, president of Phillips Petroleum Co., and 10 veteran employes were given special service-award badges June 13 for continuous service since the company's founding. The presentations were made on the thirtieth anniversary of the company. Others receiving awards were: **William M. Barbee,** Kaw City, Okla.; **William T. Garrett** and **Harris Greenberg,** both of Kansas City, Mo.; **Robert F. Jonscher,** Kansas City, Kans.; **H. E. Koopman,** Bartlesville, Okla.; **Clark E. Rummey,** Webb City, Okla.; **Esther L. Shelberg,** Des Moines; **Ernest E. Traywick,** Pampa, Tex.; **Samuel Williams,** Bartlesville; and **Bert Young,** Des Moines.

E. W. Casagrande, operations-department manager for Shell Chemical Corp. at the Dominguez refinery, has been appointed assistant plant superintendent. He has been succeeded in the operations department by **P. Janssen** whose former post of chief technologist is being filled by **R. S. Ray, Jr. F. A. Horsley,** former senior technologist in the head office, has been named assistant plant superintendent of the company's Martinez refinery, being succeeded as chief technologist by **W. G. Reynard,** whose post as operations-department manager is being filled by **G. A. White.** Other Shell Chemical Corp. promotions and transfers include: **N. Nardolillo,** from first-class machinist to maintenance assistant foreman, Shell Point; **F. H. Benzel,** from clerk to chief clerk, Dominguez; **W. Fette,** from maintenance assistant foreman, Shell Point, to engineer, Houston; and **D. H. Walbolt,** junior technologist, from the San Francisco office to New York.

J. W. Templeton has been named assistant to the director of production of General Petroleum Co. In two other major changes, **W. C. Lynch** was advanced to assistant to the manager of industrial relations, and **W. D. Joiner, Jr.,** replaced Lynch as manager of the personnel department.

E. W. Webb, formerly general production superintendent at Los Angeles for Continental Oil Co., has been made assistant manager of the production department, succeeding **R. W. French,** who recently resigned. Webb is being succeeded by **Gerald T. Pearson,** California region petroleum engineer since December. In two other major changes, **M. H. Dubrow,** Fort Worth regional petroleum engineer, has been named to the newly created post of chief petroleum engineer, and **S. V. McCollum,** division petroleum engineer at Midland, Tex., has been named to succeed Dubrow at Fort Worth.

(Continued on page 93)

Speakers' table at last week's meeting of the Division of Refining, American Petroleum Institute, at St. Louis. The men are M. G. Paulus, vice president, Standard Oil Co. (Ind.); A. P. Frame, Petroleum Advisers, Inc.; Dr. Robert E. Wilson, board chairman, Standard Oil Co. (Ind.), in charge of refining division and A.P.I. vice president; Dr. Arthur H. Compton, chancellor, Washington University; Ralph C. Champlin, Ethyl Corp.; William T. Gunn, secretary, A.P.I. Division of Refining, and C. L. Henderson, president, Vickers Petroleum Co. A report of meeting appeared in the June 7 issue, The Oil and Gas Journal, pages 37-38. Abstracts of technical papers appear on page 116 of this issue, with comments on an important paper on page 135. Also, next week's issue will feature an article by J. G. Housman, of Standard Oil Co. (Ind.), entitled "Maintenance of Tubular Heat Exchangers," which was presented at the St. Louis meeting

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24 Hours Daily

...EVERY DAY

That's the job expected of the Worthington LTC Angle gas engine compressors on pipe line service everywhere.

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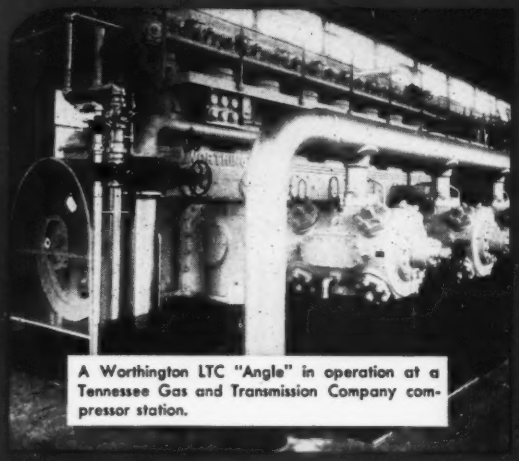
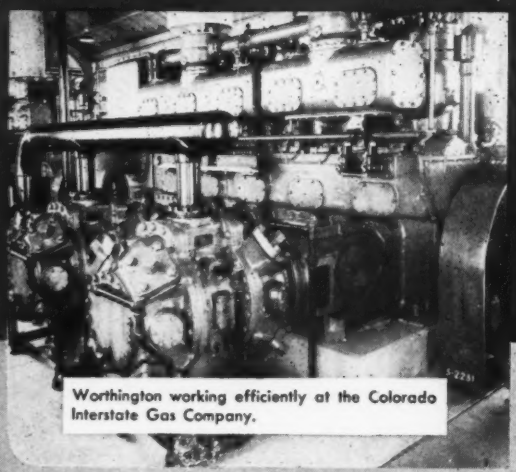
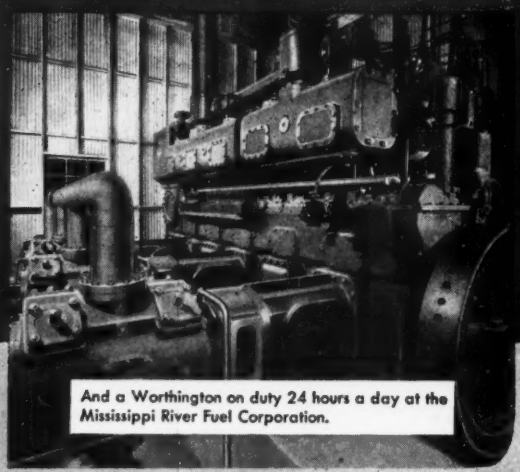


A Worthington LTC "Angle" in operation at a Tennessee Gas and Transmission Company compressor station.

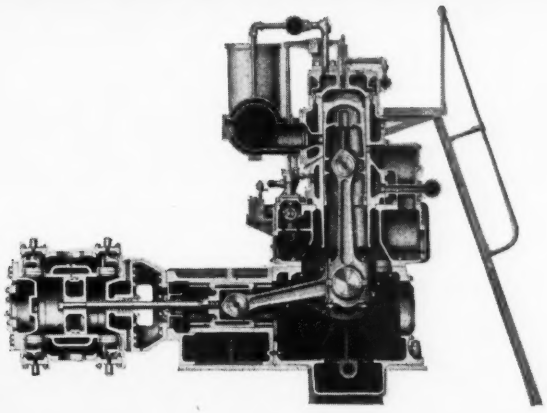
Another Worthington earning its keep at the Lone Star Gas Company.



Worthington working efficiently at the Colorado Interstate Gas Company.



And a Worthington on duty 24 hours a day at the Mississippi River Fuel Corporation.

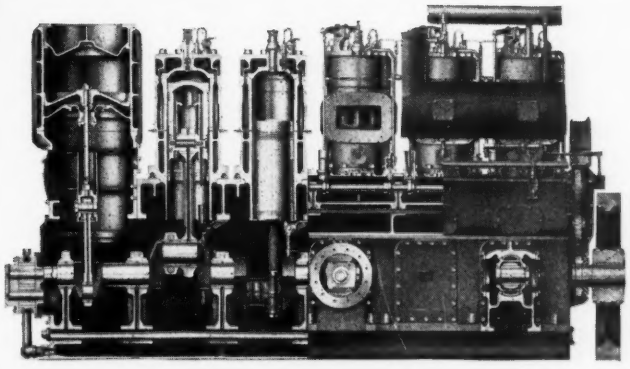


Angle Gas Engine Compressor

TYPE LTC

Oil Cooled Power Pistons

Vertical Straight-Line Power Cylinders



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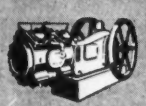
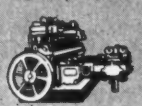
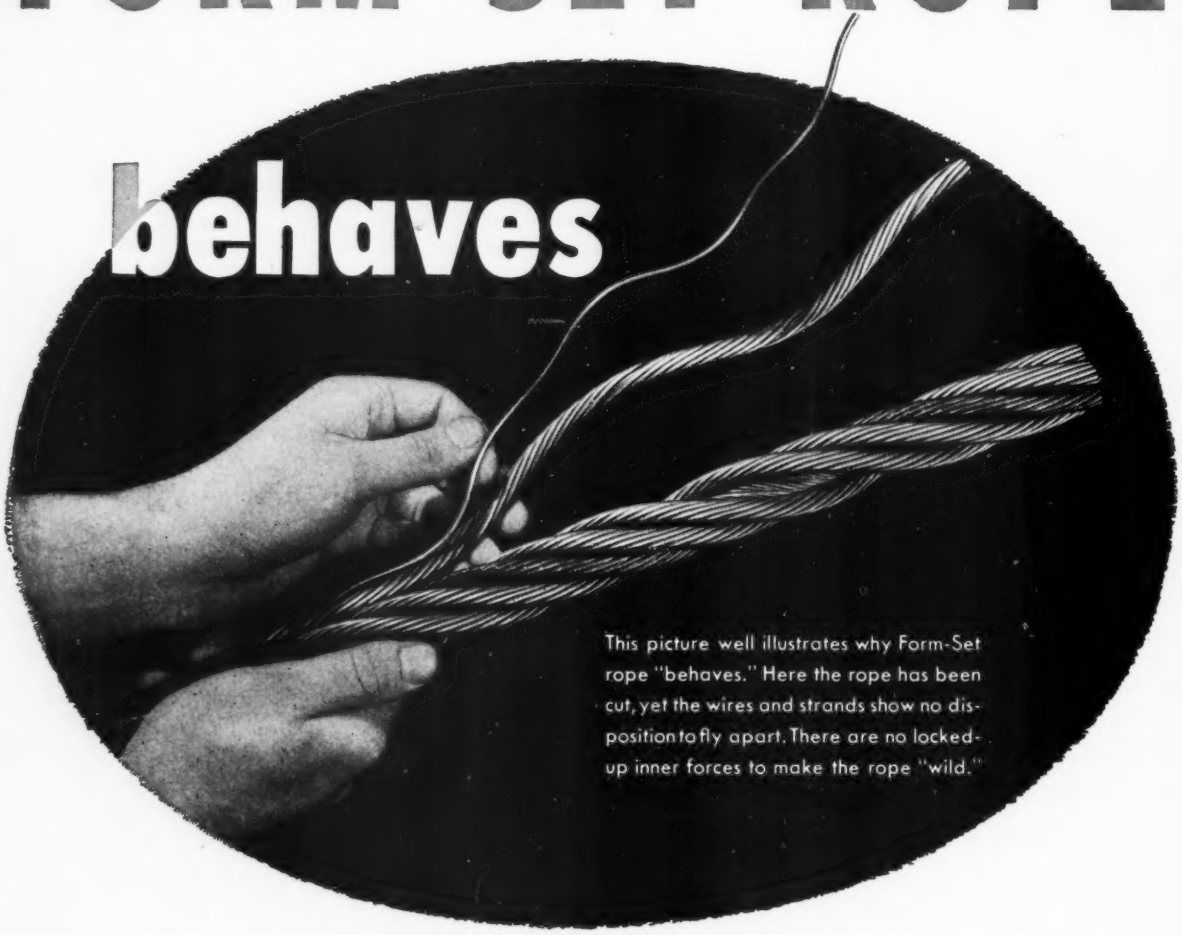
Horizontal 

Portable

Radial

Gas-Engine Compressors 

BETHLEHEM FORM-SET ROPE



This picture well illustrates why Form-Set rope "behaves." Here the rope has been cut, yet the wires and strands show no disposition to fly apart. There are no locked-up inner forces to make the rope "wild."

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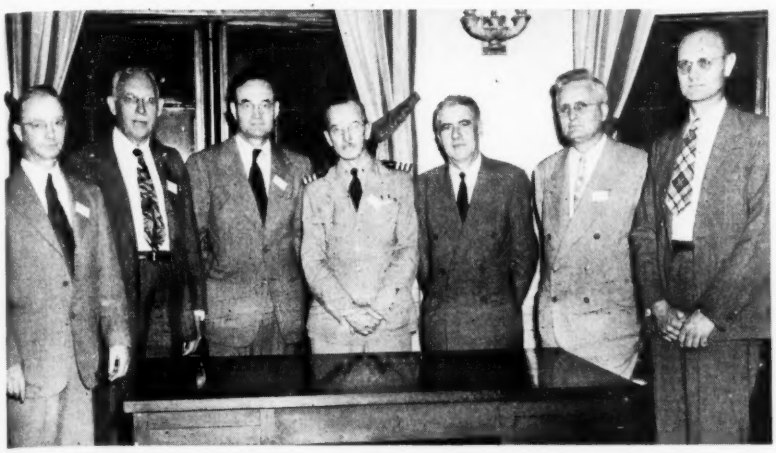


A regional meeting of the Society of Exploration Geophysicists was held June 6 in Pittsburgh. The program was designed to give Pennsylvania-area geophysicists an opportunity to hear several technical papers presented earlier this year at the national S.E.G. meeting in Los Angeles. Officers and speakers at the Pittsburgh regional meeting included this group: Sigmund Hammer, Gulf Oil Corp., Pittsburgh, chairman of the regional meeting; E. A. Eckhardt, Gulf Oil Corp., Pittsburgh, past S.E.G. president; C. H. Green, Geophysical Service, Inc., Dallas, S.E.G. president; Comdr. Beauregard Perkins, Jr., U.S.N., dinner speaker; Eugene McDermott, Geophysical Service, Inc., Dallas, past S.E.G. president; R. D. Wyckoff, Gulf Oil Corp., Pittsburgh, past S.E.G. president; and W. B. Robinson, Gulf Oil Corp., Pittsburgh, chairman of local arrangements for the meeting

Tallent H. Ransome, president of Ransome Co., Emeryville, Calif., has been elected president of the Liquefield Petroleum Gas Association to succeed **Charles O. Russell,** Thermogas Co., Inc., Des Moines, Iowa. Russell was named treasurer.

Shifts

J. M. Wear, superintendent, The Texas Co., El Campo to Houston; **C. H. Thurber,** engineer, Plymouth Oil Co., Big Spring to San Angelo; **James O. Jarman,** superintendent, Dalport Oil Corp., Pecos to Colorado City, Tex.; **A. G. Eberts,** foreman, The Texas Co., Cotulla to Galveston; **W. H. Drushel,** superintendent, The Texas Co., El Campo to Daisetta; **W. A. McFadden, Jr.,** geologist, Western Geophysical Co., Lubbock to Rockdale, Tex.

D. V. Kitley, engineer, Ohio Oil Co., Henderson to Iraan, Tex.; **R. L. Mills,** superintendent, Humble Oil & Refining Co., Sugarland to Dickinson, Tex.; **W. A. McKee,** superintendent, Frank & George Frankel, Houston to Oshkosh, Wis.; **E. Glenn Albright,** foreman, Atlantic Refining Co., Seminole, Okla., to Ozona, Tex.; **Leo Ed Suck,** engineer, Standard Oil Co. of California, Los Angeles to Whittier, Calif.; **Alvin H. Friedman,** chemist, Phillips Petroleum Co., Bartlesville to Kansas City, Mo.

E. E. Clark, engineer, Phillips Petroleum Co., Bartlesville to Kaw, Okla.; **Milton E. Fox,** engineer, Carter Oil Co., Purcell to Seminole, Okla.; **Elmer E. Moelling,** foreman, Olson Drilling Co., Purcell to Elk City Okla. **Edward G. Dofrick,** geologist, The California Co., New Orleans to Lexington, Ky.; **D. D. Moore,** geologist, Seismic Explorations, Inc., Farmersville, La., to Shawnee, Okla.; **V. E. O'Donnell,** engineer, Stanolind Oil & Gas Co., Jennings, La., to Woodsboro, Tex.

A. E. Brink, foreman, Carter Oil Co., Waterproof, La., to Magnolia, Ark.; **Frederick F. Dueser,** engineer, Republic Natural Gas Co., Golden, Colo., to Ellinwood, Kans.; **Fred H. Moore,** geologist, Magnolia Petroleum Co., Mt. Vernon, Ill., to Roswell, N. M.; **Edward W. Grieneeks,** foreman, Pure Oil Co., West Liberty to Noble, Ill.; **J. F. Amelunxen,** engineer, Venezuelan Atlantic Refining Co., New Castle, Del., to Caracas, Venezuela; **G. L. Squier,** engineer, Great Lakes Pipe Line Co., Grinnell to Osceola, Iowa.

John R. Phillips, engineer, Shell Chemical Corp., Louisville, Ky., to Savannah, Ga.; **Kermit D. Hutchins,** engineer, Magnolia Petroleum Co., Canton, Miss., to Dallas; **Carl Van Hooser,** engineer, Kingwood Oil Co., Jackson, Miss., to Perry, Okla.; **George L. Goodin,** engineer, Ohio Oil Co., Casper, Wyo., to Henderson, Tex.; **Roy C. Carpenter,** superintendent, Rocky Mountain Drilling Co., Lyman, Wyo., to Fresno, Calif.; **D. E. Carr,** engineer, Union Oil Co. of California, Wilmington to Los Angeles; **L. D. Griffin,** engineer, N. H. Wheless Drilling Co., Lake Charles to Columbia, La.; **V. R. Lay,** superintendent, N. H. Wheless Drilling Co., Pineville to Ruston, La.

DEATHS

R. J. Daniel, 67, who retired in March 1946 as assistant treasurer of The Texas Co. in Houston, died June 4 in Houston.

H. L. Brelsford, 46, assistant division chief clerk of the East Texas division of Humble Pipe Line Co., died May 29 in Longview.

Rupert Arthur Fouts, 77, retired oil operator, died June 2 at his home in Houston.

Edmund Wilson Hollands, 39, district engineer and assistant superintendent for Phillips Petroleum Co. at Ardmore, Okla., died June 1 in Coffeyville, Kans.

Lou D. Ladd, 63, independent operator, died June 1 at his home in Fort Worth.

W. S. Rapp, 51, senior clerk in the purchasing department of The Texas Co., died June 3 at his home in Houston.

Odus A. Russell, 51, oil operator of Duncan, Okla., and Mt. Vernon, Ill. died June 2 in a St. Louis, Mo., hospital.

Rudolph Miller, tax agent and assistant treasurer of Standard Oil Co. of California, died recently at his home in Piedmont, Calif.

Ray C. Hauber, 50, assistant division superintendent of Cities Service Oil Co. at Great Bend, Kans., died June 6 at his home in Great Bend. He had been with the company since 1919.

William H. Knight, 61, Tulsa, associated with Mid-Continent Petroleum Co. from 1918 until his retirement early this year, died June 7.

Pierre E. King, Mattoon, Ill., oil operator, died June 8 in an Effingham, Ill., hospital of injuries sustained in an automobile accident May 21.

Vassily S. Zavoico, 75, who retired 10 years ago after serving as managing director of many former Russian oil companies, died June 8 in New York.

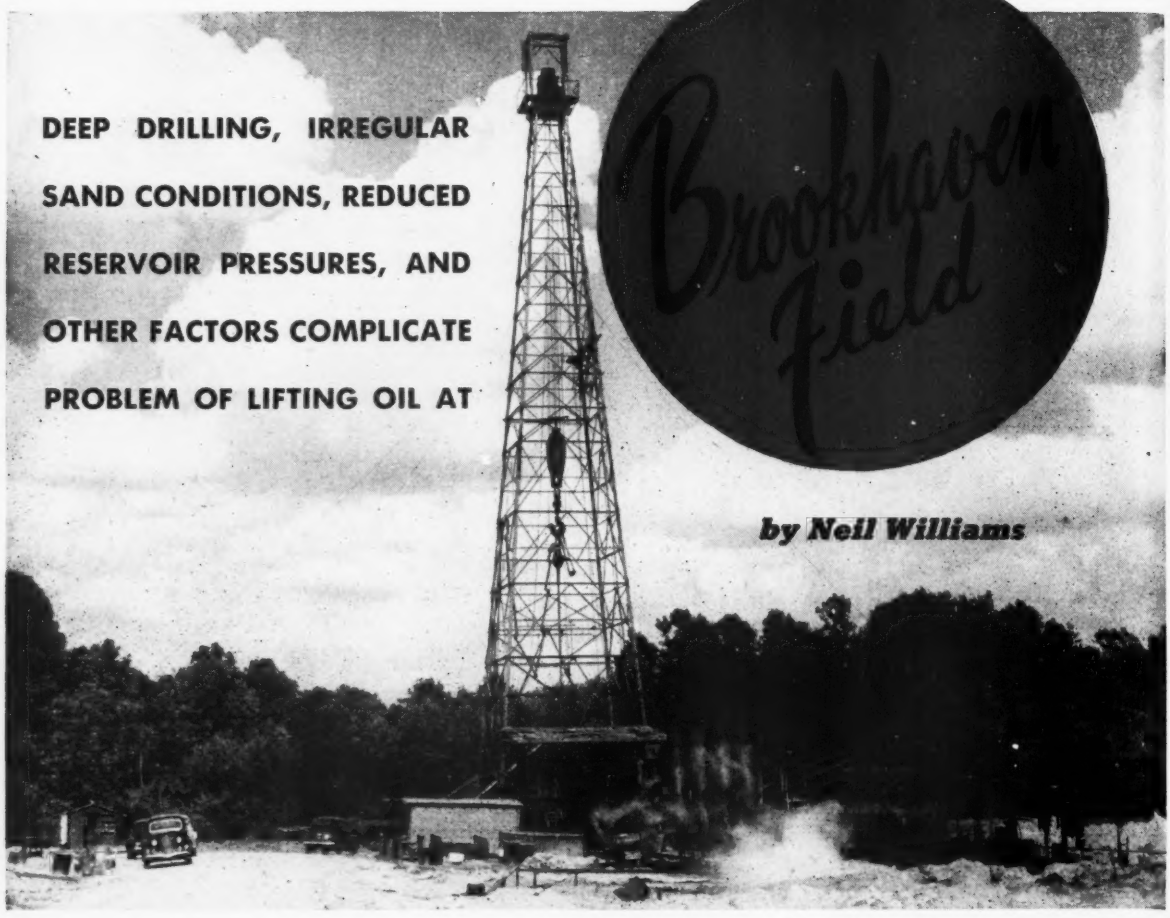
David V. Davis, 52, independent operator, died June 4 at his home in Atlanta, Tex.

Henry Hobbs, 63, founder and president of the old Hobbs Oil Co., died June 6 in a Wichita Falls, Tex., hospital.

Brookhaven Field

DEEP DRILLING, IRREGULAR SAND CONDITIONS, REDUCED RESERVOIR PRESSURES, AND OTHER FACTORS COMPLICATE PROBLEM OF LIFTING OIL AT

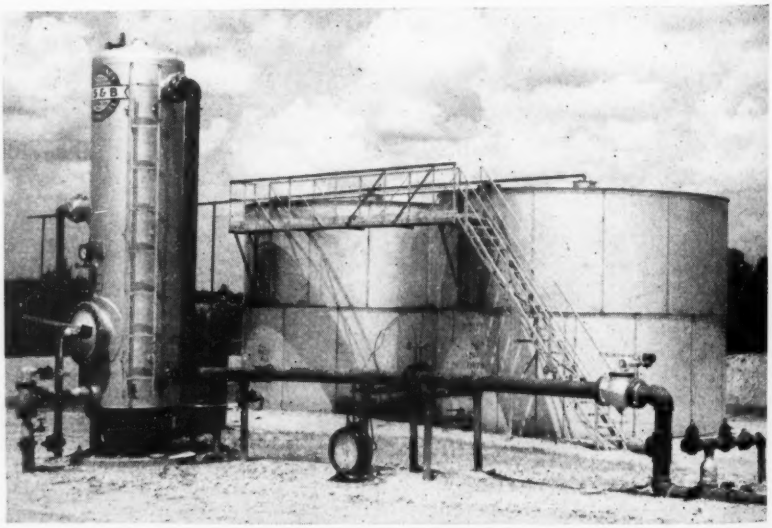
by Neil Williams



One of five steam rigs operating in Brookhaven field. Because of lack of gas for boiler fuel most rigs are power or diesel-electric assemblies

CURRENTLY the scene of one of the most active drilling programs of recent years, Brookhaven field in Lincoln County, southwestern Mississippi, is one, however, in which highly lenticular and irregular sand conditions, low reservoir pressures, undersaturated production, and below-the-average depth have combined to complicate development and create exceptional problems in lifting the oil and insuring most effective and efficient recoveries. Although development is not complete and the field still is in what might be termed its "flush" stage, rapidly declining reservoir pressures, which at the present rate of decline are expected to reach the bubble point within the next 9 to 10 months, are making the problem of lifting the oil one of immediate and most important concern of all operators.

Production now extends over an area approximately 6 miles long from north to south and from 2 to 3 miles wide east to west and totaling up to 10,000 acres. Over the crest of the structure, however, there is a "bald" area of from 1,100 to 1,200 acres, irregularly shaped, in which the sands shale out, and in which only dry holes have been drilled. Productive limits of the field as yet are somewhat uncertain. Several wells around the periphery of the present productive area on the northwest, west, and southwest have found water and appear to define the field on those sides, but since the indicated water level seems to vary in different sand lenses, it is considered possible for production to extend beyond these wells. In several instances good wells

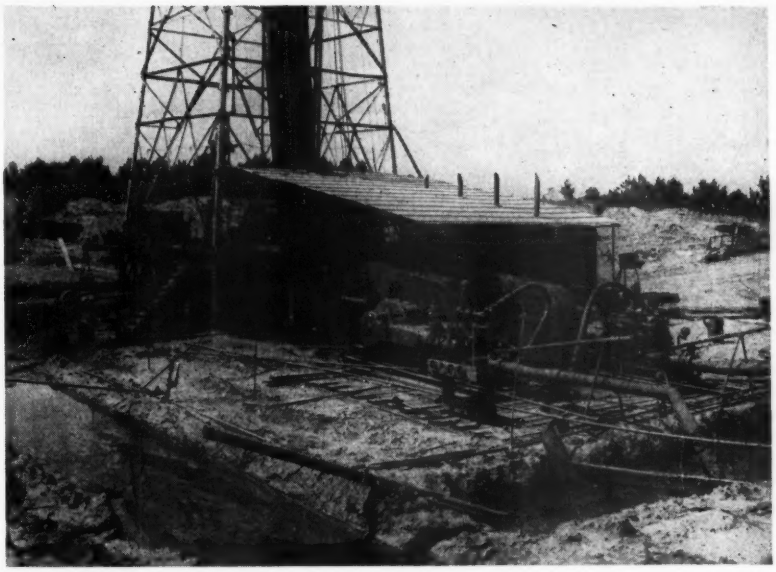


Typical separator and tank battery installation at Brookhaven

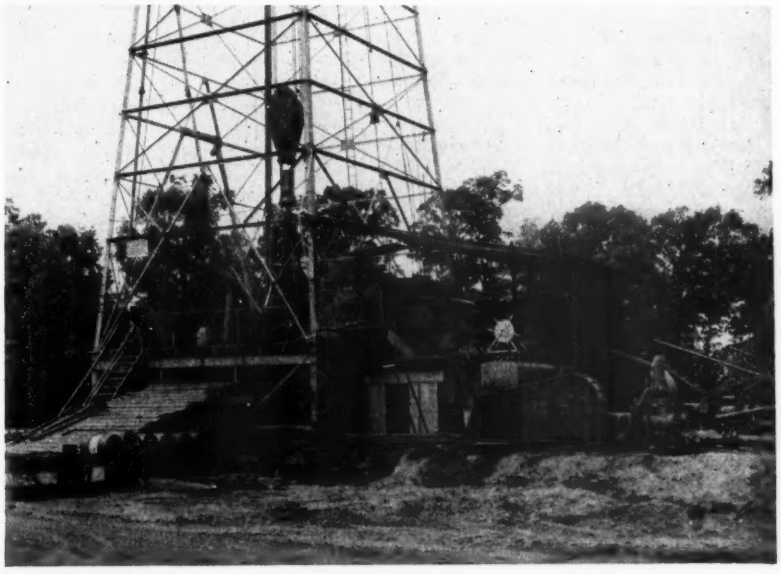
without a trace of water have been completed at depths of as much as 30 ft. below the water level of other wells. A dry hole on the extreme northeast side apparently defines the field in that direction, but of the 13 dry holes which have been drilled this is the only one that definitely is off structure. The other 12 are all within the productive limit, 8 of them being within the "bald" area over the top of the structure.

Total of 79 Tests Drilled

Up to the middle of May, 66 producing wells had been completed in the field by 9 different companies and operators (Table 1). With the 13 dry holes, a total of 79 tests had been drilled. On the uniform 40-acre spacing pattern being followed, it is estimated that the present indicated proved area, when drilled up, will contain around 200 wells. Through April, the field had produced a total of approximately 2,512,650 bbl. Peak production was attained during January when daily average withdrawals exceeded 14,000 bbl. with a total of 34 wells at the end of the month. Since then, because of the excessive rate of reservoir pressure decline,

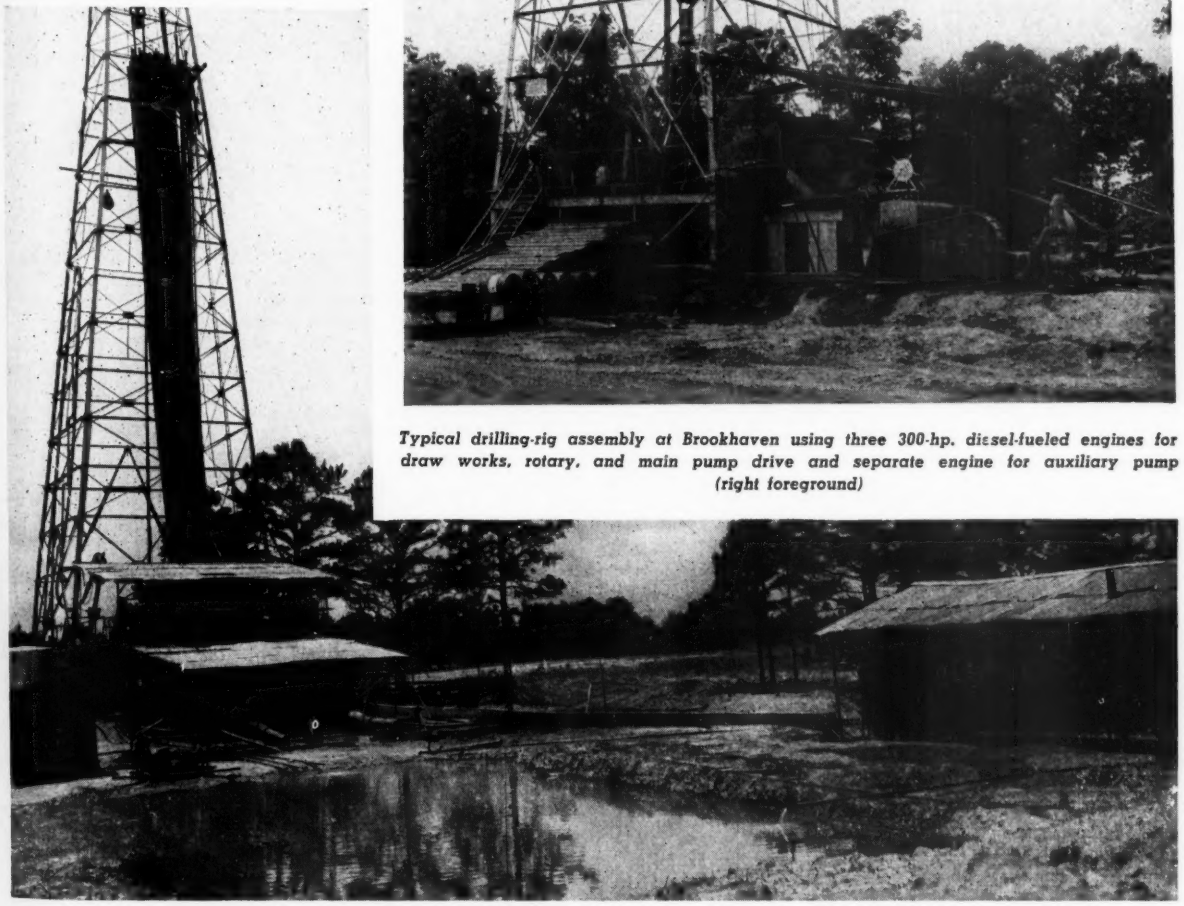


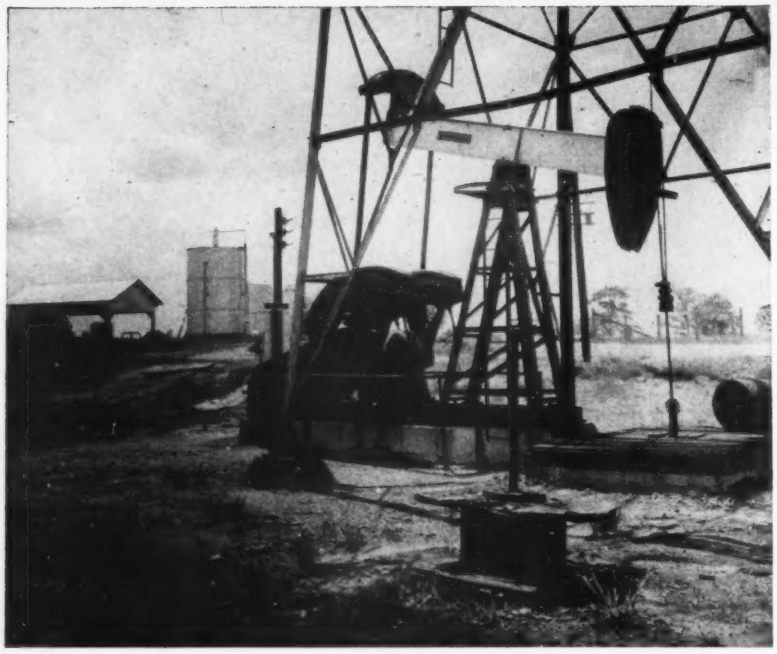
One of newest and largest power rigs using four 300-hp. diesel engines



Typical drilling-rig assembly at Brookhaven using three 300-hp. diesel-fueled engines for draw works, rotary, and main pump drive and separate engine for auxiliary pump (right foreground)

Below: Diesel-electric drilling-rig assembly. Power plant appears under housing at right





California Co. 1 G. T. Smith, discovery well, completed in March 1943

operators voluntarily have set 10,000 bbl. as the maximum rate of daily withdrawals, allocating this to the individual wells on the basis of sand thickness, acreage, and other factors. The cutback brought daily average withdrawals down to 9,364 bbl. in February with 39 wells. With the increasing number of wells, current withdrawals have climbed to the 10,000-bbl. daily maximum, averaging around 150 bbl. daily per well.

Structurally, the field is an elongated anticline probably resulting from a deep salt movement or swell. Some faulting is present but it is believed to be only incidental to the structure and entrapment of oil. Producing sands occur in the lower part of the Tuscaloosa formation, (basal Upper Cretaceous) at depths ranging from 10,138 to 10,541 ft. Top of the section at its highest points is at a subsea depth of around 9,750 ft., and with water levels found at subsea depths of 10,010-40 ft., there is an indicated closure of from 360 to 390 ft. Surface elevations range from 429 to 517 ft., the average being from 480 to 490 ft.

The producing section contains three main members or zones identified locally as the Pilot, Case, and Smith sands. The latter, the basal zone, corresponds in a position to the Massive sand, the main producing horizon at Cranfield and several other Mississippi fields, although in this field it is not as well developed as the true Massive sand and is not referred to as such. The Case sand, or second zone, is the equivalent of the stringer zone usually found above the Massive sand in other Mississippi Tuscaloosa fields. Sands come in and shale out irregularly through the section from one well to another, and so far as known none is continuous over the entire field.

Effective sand thickness averages 30 to 35 ft., but varies widely and erratically according to the amount of shaling. In some places, notably within the bald area of from 1,000 to 1,200 acres over the crest of the structure, little or no sand is found. In others, as much as 145 to 150 ft. of almost unbroken sand has been present. Permeability also varies greatly from well to well in the range of 0 to around 2,700 md., so that even where sand is present the permeability may be too poor to produce or permit more than a small well. Indicative of this is the fact that 11 out of the 66 wells so far completed in the field have had to be completed on the pump. These, including the discovery well, one of the structurally highest wells, are at scattered locations over the field. In several cases they are offset by some of the best flowing producers. Peculiarly, in some instances the sand is present with permeability but entirely devoid of saturation. In view of these variable conditions there has been no assurance of what to expect in the way of a well from location to location. Consequently, every well so far has been drilled more or less as a wildcat.

Original Reservoir Pressure

Original reservoir pressure is estimated to have been approximately 4,600 psi. Current average bottom-hole pressure (—9,800-ft. datum) is 3,600 psi., a drop of 1,000 psi., or about 400 psi. per million barrels of oil produced. Determined by laboratory tests of representative bottom production samples, the bubble point, at which pressure all wells will have to be produced by pumping or other artificial means, is approximately 2,200 psi. At the present rate of reservoir pressure decline of around 3 psi. per day, it is estimated that this point will be reached some tme in March or early April of 1948.

TABLE 1—DEVELOPMENT STATUS IN BROOKHAVEN FIELD MAY 10

Company—	Oil wells comp.	Dry holes comp.	Drlg. wells
California Co.	33	8	17
California-Rees Oliver	0	1	0
California-Skelly	0	0	1
California-Warren Pet.	0	1	0
Crescent Drilling Co. (Sohio)	1	0	1
R. J. Carraway	0	0	2
Danciger Oil & Ref.	2	1	1
Hunt Oil Co.	0	0	1
Loffland Bros.	0	0	1
Lyons & Prentiss	1	0	0
Parker Drilling Co.	1	0	0
Roeser & Pendleton	13	2	4
Stanolind Oil & Gas	3	0	4
Sun Oil Co.	11	0	9
Sun-Skelly Oil Co.	0	0	1
W. Wright	1	0	1
Total	66	13	42

Fluid Levels

Fluid levels at the reservoir bubble-point pressure are expected to be around 5,500 ft. At this depth pumping will be economical but as time goes on and the pressures continue to decline fluid levels will be lowered steadily and pumping will have to be from progressively greater depths. The economic limit of pumping in this field is expected to be reached when fluid levels are down to approximately 8,000 ft. At that time, unless other more economical means of lifting the oil are provided, abandonment of the field will be forced. Increasing gas-oil ratios due to gas coming out of solution will lighten the column but the bottom-hole pressure will not be great enough to make the wells flow again. It is calculated that fluid levels will drop to the 8,000-ft. economic pumping limit when reservoir pressures decline to approximately 820 psi. At anticipated rates of withdrawals and pressure declines it is calculated that the critical 820-psi. reservoir-pressure point under natural depletion by pumping will be reached by the end of 1955.

The field contains an estimated 320,000 acre-ft. of productive sand with 173 bbl. of recoverable oil per acre-foot, or a total reserve of 55,360,000 bbl. Cumulative production by the end of 1955 under projected withdrawal rates, which will have been reduced at that time to approximately 5,000 bbl. daily, an average of 25 bbl. per well, are expected to be around 45,415,000 bbl. Consequently, abandonment of the field at that time, which will be due to uneconomical operation rather than depletion, will leave approximately 9,920,000 bbl. of otherwise recoverable oil in the reservoir, and reduce the expected recovery under natural depletion from 173 bbl. to 142 bbl. per acre-foot.

Faced with this prospect, oper-

ators are considering undertaking a gas-injection project in which an attempt will be made to prevent decline of reservoir pressure below the bubble point of 2,200 psi. Since this pressure is expected to be reached by March or April of 1948, efforts will be made to have the project in operation by that time or shortly after. Steps toward working out a suitable unitization agreement for the highly diversified lease and royalty interests in the field already are being taken.

Gas requirements to maintain reservoir pressure at or slightly above the bubble point and sustain an increase in oil withdrawal rate to 20,000 bbl. daily are estimated at around 11,517,000 cu. ft. daily for the start of the project. By the end of 1948, however, it is expected that the injection rate will have to be increased to approximately 18,000,000 cu. ft. daily. Solution gas in the reservoir is only 520 cu. ft. per bbl. of oil and with gas-oil ratios averaging less than 350 cu. ft. per bbl., gas production in the field will not exceed 8,000,000 cu. ft. daily. Of this, 3,000,000 cu. ft. daily will be needed for fuel and other field use, which will leave only 5,000,000 cu. ft. daily available in the field for injection purposes. Because of this, the additional required 13,000,000 cu. ft. of gas daily will have to be obtained from extraneous sources outside the field.

Source for Extraneous Gas

A possible source for this extraneous gas is Gwinville field, 35 miles northeast of Brookhaven in Jeff Davis County, and one of the largest gas reserves in the Mississippi and Gulf Coast region. It is proposed that the gas be purchased from Southern Natural Gas Co., which, if the project is undertaken, will complete an 8⅝-in. line from that field by March 1, 1948, and deliver the gas at a pressure of 850 psi. in required volumes up to 20,000,000 cu. ft. daily.

In the prospect project injection of extraneous purchased gas will be continued over a period beginning not later than July 1, 1948 (preferably before March) and ending at the close of 1956, a total of more than 8½ years. During this period wells probably may continue to require artificial lifting, but with pressures being maintained at the bubble point pumping will always be from a maximum depth of 5,500 ft., except for a few of the tighter and/or water-logged wells. By the end of 1956, it is anticipated that gas-oil ratios will be great enough to start wells flowing again, and that they will continue to flow until reservoir depletion, which, it is calculated, will be effected at the close of 1959.

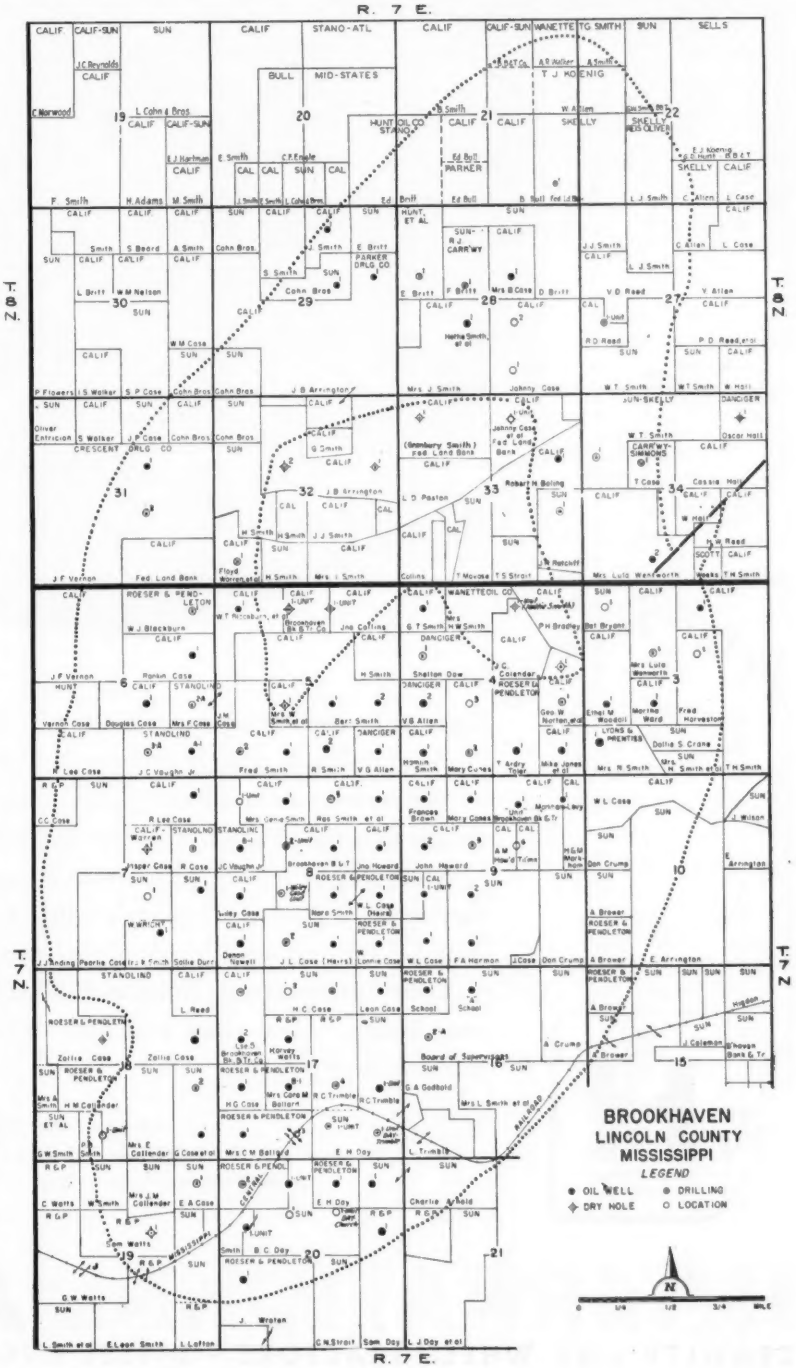
From the start of the project to the close of 1951, 3½ years, injection rates and withdrawals are expected to be kept fairly constant. After that, they are expected to be tapered off gradually each year until the end.

Under pressure-maintenance operations, it is calculated that cumulative oil recovery will total 64,212,000 bbl., or 18,797,000 bbl. more than the expected recovery by natural depletion and pumping alone. Of this additional recovery, it is estimated that more than 10,112,000 bbl. will be recoverable oil that would have been left in the reservoir by premature abandonment of the field under natural depletion because of uneconomical operation. The other 8,685,000 bbl. will be actual increased recovery from the reservoir because of pressure maintenance.

Although the field was opened in March 1943, the second well, which initiated the present drilling activity,

(Continued on page 124)

Approximate contour of present productive area. Dotted line in top center encloses "bald" or dry area at crest of structure. (Base by Mississippi Oil and Gas Engineering Committee)



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Production Almost Doubled Since 1941 In Southwestern Oklahoma

by Charles J. Deegan

RECENT important strikes have swung the limelight in Oklahoma on the Anadarko basin, as a geological province. However, more careful examination of the production records indicates that the whole southwestern section of Oklahoma has been developing steadily and with little fanfare into increasing importance. Instead of just the Anadarko basin, there is an important oil-producing region developing, not only on the north flank of the Wichita Mountain uplift (Anadarko basin) but also on the south flank, and other fields whose geology is closely associated with the Arbuckle Mountain uplift. This area can be best described as southwestern Oklahoma, and considered geographically, instead of in geological terms.

This region has almost doubled its daily average production since 1941, from about 59,000 to 116,500 bbl. in May 1947. (See Table 1.) Of this total increase of 57,500 bbl., almost all, on net balance is coming from 14 fields which have either been discovered since 1941, or have had their major development since that time. (See Table 2, Important New Pools.)

Of the three big pools that accounted for the bulk of 1941's production, Cement, Healdton, and Hewitt, additional development at Cement has held the decline of the combined

TABLE 1—SOUTHWESTERN OKLAHOMA PRODUCTION RECORD BY COUNTIES SINCE PREWAR PERIOD
(Barrels daily average production)

	Average for year						1947		
	1941	1942	1943	1944	1945	1946	Jan.	Feb.	Mar.
Caddo County	9,750	13,710	13,365	17,645	20,315	17,370	16,550	16,525	17,390
Carter County	31,685	27,130	23,800	23,255	24,080	26,700	28,425	28,065	28,960
Comanche County	15	10	140	190	170	235	225	245	255
Cotton County	855	775	710	665	610	3,075	10,325	14,335	15,210
Garvin County	875	3,050	6,240	12,485	13,680	12,355	17,020	16,785	17,830
Grady County	1,760	1,505	1,355	1,225	1,105	1,180	1,180	1,295	1,260
Jackson County	1,530	1,085	835	725	640	570	510	520	440
Jefferson County	1,675	1,725	1,500	1,370	1,210	1,355	1,600	1,660	1,695
Kiowa County	2,380	1,060	195	120	310	660	755	945	1,075
Love County	25	20	25	25	20	40	25	50	85
McClain County	120	360	385	365	560	1,540	2,365	3,545	5,100
Stephens County	5,395	6,200	6,610	8,010	9,180	13,160	19,570	21,100	22,200
Eillman County	2,900	1,915	1,260	910	835	645	530	570	555
Washita County	....	....	5	220	250	145	170	160	140
Total	58,965	58,545	56,425	67,210	72,965	79,030	99,250	105,800	112,195

Production total area week ending May 24, 1947 = 116,500 bbl. per day.

TABLE 3—SOUTHWESTERN OKLAHOMA TEN LEADING CRUDE-OIL PRODUCERS
(Barrels daily average production)

Company—	Dly. prod. Mar. 1947	Dly. prod. 1941	Increase	Per cent increase	Per cent of Mar. prod.
Skelly Oil Co.	10,800	1,400	9,400	671.4	9.6
The Texas Co.	8,300	1,000	7,300	730.0	7.4
Magnolia Petroleum Co.	6,300	7,100	*800	*11.3	5.6
Amerada Petroleum Corp.	4,700	100	4,600	4,600.0	4.2
Pure Oil Co.	4,200	600	3,600	600.0	3.7
Phillips Petroleum Co.	3,600	1,100	2,500	227.3	3.2
Sinclair Prairie Oil Co.	3,400	1,100	2,300	209.1	3.0
Gulf Oil Corp.	3,200	1,600	1,600	100.0	2.9
Carter Oil Co.	2,800	2,200	600	27.3	2.5
Ohio Oil Co.	2,700	2,400	300	12.5	2.4
Subtotal	50,000	18,600	31,400	168.8	44.5
All others	62,200	40,400	21,800	53.9	55.5
Total	112,200	59,000	53,200	90.2	100.0

*Decrease.

TABLE 2—SOUTHWESTERN OKLAHOMA—IMPORTANT NEW AND OLD POOLS
(Barrels daily average production)

Pool and county—	Average for year						1947			Production week end.
	1941	1942	1943	1944	1945	1946	Jan.	Feb.	Mar.	5-24-47
Important New Pools										
Antioch, Southwest, Garvin	....	....	....	....	....	1,650	6,200	5,250	5,900	6,600
Apache, Caddo	480	4,790	6,310	6,245	6,330	4,380	4,555	4,455	4,710	4,700
Cache Creek, Cotton	....	....	....	....	....	1,775	6,710	9,020	9,080	10,200
Hoover, Northwest, Garvin	....	....	....	280	630	1,200	1,180	1,370	1,350	1,400
Katie, Garvin	....	....	....	....	....	25	210	310	330	500
Lindsay area, McClain	....	....	....	....	100	255	750	1,460	2,560	2,900
Lone Grove, Southwest, Carter	....	....	....	540	2,610	4,630	4,325	4,280	4,320	4,500
Maysville, Southwest, Garvin	....	....	....	....	....	135	850	1,020	1,010	1,800
Soldier Creek, Cotton	....	....	....	....	....	360	2,520	3,860	4,225	4,400
Velma, Stephens	855	1,190	1,655	2,180	2,770	5,785	10,400	11,570	12,375	12,800
Velma, West, Stephens	....	....	....	....	....	1,105	2,560	2,460	2,610	2,800
Washington, McClain	....	....	....	90	310	755	680	825	770	800
Wayne, Southwest, McClain	....	....	....	....	....	165	635	1,100	1,580	1,800
Wildcat Jim, Carter	460	1,050	1,400	1,360	1,475	1,940	2,640	2,940	3,180	3,300
Subtotal	1,795	7,030	9,365	10,695	14,225	24,160	44,215	49,920	54,000	58,500
Important Old Pools										
Cement, Caddo	9,240	8,900	7,060	11,400	13,985	12,985	12,000	12,075	12,675	12,700
Healdton, Carter	8,450	7,740	7,160	6,850	6,620	6,670	6,535	6,475	6,570	6,500
Hewitt, Carter	12,410	9,120	6,490	5,570	4,925	4,680	4,610	4,595	4,585	4,500
Subtotal	30,100	25,760	20,710	23,820	25,530	24,335	23,145	23,145	23,830	23,700
All other pools	27,070	25,755	26,350	32,695	33,210	30,535	31,890	32,735	34,365	34,300
Grand total	58,965	58,545	56,425	67,210	72,965	79,030	99,250	105,800	112,195	116,500

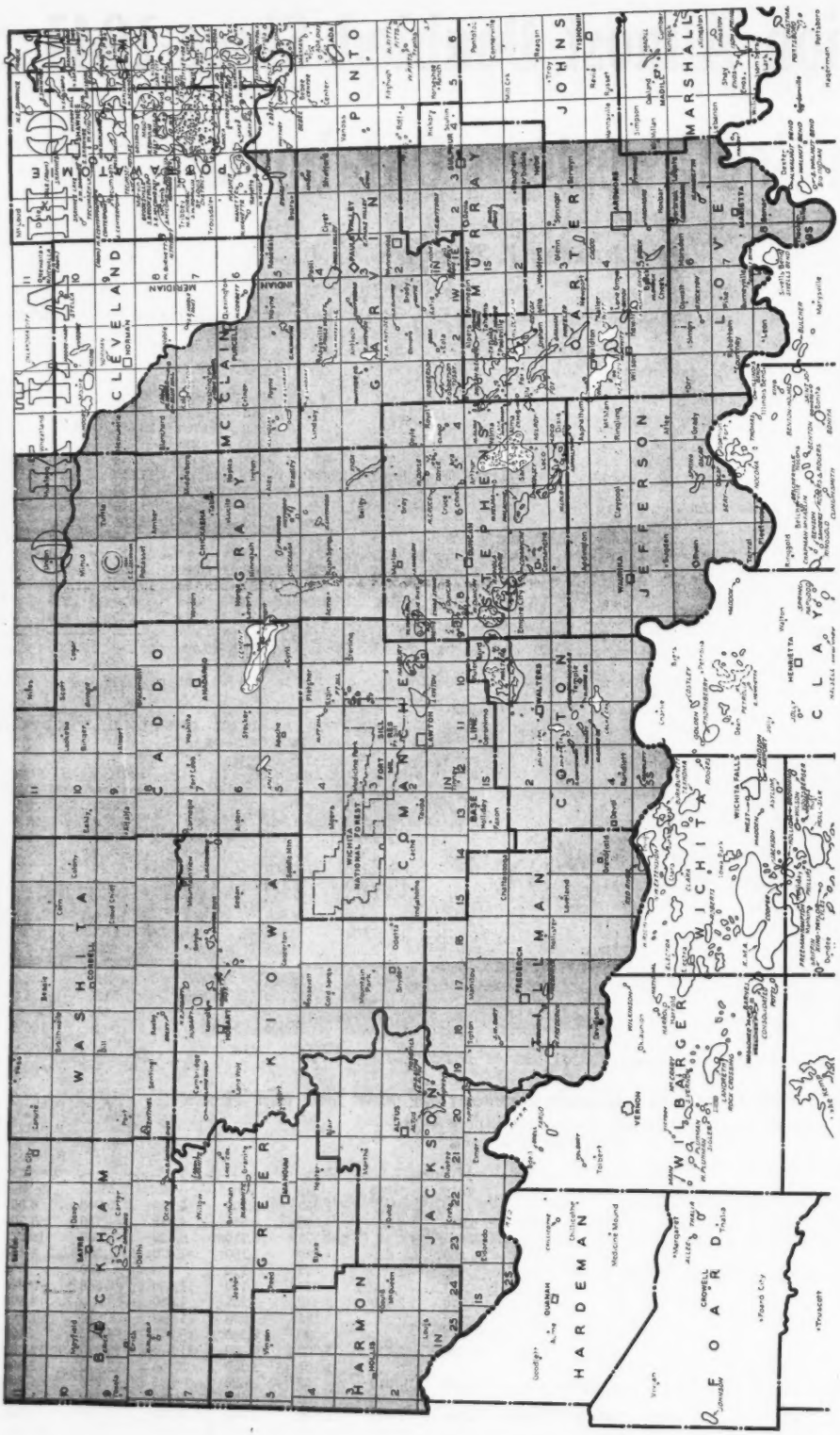


Fig. 1—White outlines in shaded area indicate important new and old fields. (Map courtesy Jacobson Map Co.)

pools to about 20 per cent in the 6-year period. Additional development in other older pools, plus some smaller new ones, has just about compensated for the decrease in the three old big fields. (See Table 2, Important Old Pools, and All Other Pools.)

While public attention has been centered on the Anadarko basin pools like Antioch and the Lindsay area, the Velma area and Cache and Soldier Creek on the other flank of the Wichita Mountain uplift, in March accounted for about 28 per cent of all the oil produced in southwestern Oklahoma.

There are some oil men (including quite a few top-ranking geologists) who believe that for broad bird's-eye-view judgments about where future oil regions will develop, map study, regardless of geology, is well worth while. The geologists among these men argue that until more definite scientific information is available on the "why" of oil accumulation, empirical judgments formed by study of geographic trends of oil fields are justified. The nongeologists simply say that studying map trends works out.

These map readers contend that regardless of variation in local geological conditions, every sign points toward the presence of many oil fields in southwestern Oklahoma. They aver that oil fields will be developed south and west from the Seminole area, south and west of Oklahoma City. They also contend that the gaps between the fields of North Texas and the Wichita Mountain uplift in Oklahoma will be filled.

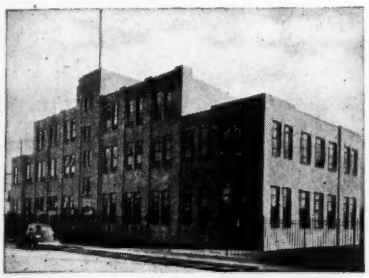
Since there is a lot of good regional geology that points to the same trends as those of the map readers, even though based on more than one geological province, there will be few arguments about the future of the area.

Table 3 shows the 10 leading producing companies in the area, as of March 1947, the latest month for which official production figures are available. Although these companies still have less than 50 per cent of the total production, they have been increasing their proportionate share since 1941 much more rapidly than all other producers combined.

Laboratory Aid—AVAILABLE TO HELP YOU FIGHT CORROSION

A major activity of the INCO Research Laboratory at Bayonne, New Jersey, is the study of corrosion.

While field tests are often to be preferred when selecting a metal for some specific purpose, laboratory tests are much better for studies of a more fundamental



Main Research Laboratories of The International Nickel Company, at Bayonne, N. J. A separate section is devoted to corrosion research.

nature such as the principles of galvanic corrosion . . . *or for extending the data obtained from field tests.*

In these roles, INCO laboratory research takes various forms.

Controlled Conditions

On some occasions, corrosion tests are carried out under controlled conditions to simulate actual service when it is not feasible to make plant tests.

In other instances, the Laboratory can be used to establish which of several factors is of *controlling* importance in a given corrosion problem. Sometimes, too, laboratory testing is needed to explain anomalies that cannot be investigated satisfactorily by further field testing, e.g., effects of impurities in process liquors.

Laboratory testing is extremely helpful after field tests have been carried to a point requiring isolation and separate study of individual factors such as aeration, temperature and velocity.

Laboratory Examination

Another phase of the Laboratory's work is the examination of materials or parts that have corroded in service. Here, trained corrosion engineers and laboratory technicians examine the specimen to determine the nature of the attack, the probable mechanism of corrosion, and the presence of any correctible causes of sub-normal corrosion resistance.

Reliable Recommendations

Such complementary testing makes possible reliable recommendations of how to minimize corrosion in service and how to select the metal or alloy best able to perform under the influence of the dominating factor (or factors) revealed.

Thus, INCO laboratory testing and INCO field testing work hand in hand in the fight against corrosion.

The two types of testing always should be considered complementary...not competitive. Very often *both* are necessary for a complete understanding of the corrosion problems brought to INCO.

One type of apparatus used at the Bayonne laboratory for control of motion, temperature and aeration in immersion corrosion tests.

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(No. 4 in a series describing the corrosion research program of THE INTERNATIONAL NICKEL COMPANY.)

An Investigation of Errors in

BOTTOM-HOLE-PRESSURE MEASUREMENT

by H. W. Perkins* and P. E. Chaney*

RESERVOIR performance calculations are based almost entirely upon bottom-hole-pressure data, and an error of a few pounds per square inch in the bottom-hole-pressure measurement may lead to serious errors in the calculations and conclusions as to reservoir conditions which are based upon these data. In most reservoir-engineering calculations, the drop in reservoir pressure from original conditions is more important than the actual reservoir pressure. For example, let us assume that the initial bottom-hole pressure on a particular reservoir is measured as 3,850 psi., and the pressure 6 months later, after producing 100,000 bbl. of fluid, is measured as 3,825 psi. An error of 15 psi. in the total pressure, if applied to one reading would be a 0.39 per cent error in the total measurement. An error of this magnitude would be insignificant in engineering calculations. However, the figure upon which most reservoir-engineering calculations are based would be, in this case, 3,850 — 3,825, or 25 psi. of pressure drop. An error of 15 psi. in only one of the two pressure measurements would result in an error of 60 per cent in this differential pressure and would lead to erroneous conclusions as to the performance of the reservoir.

In view of these facts, an investigation was undertaken to determine the degree of precision to be expected in bottom-hole-pressure measurements in order to evaluate properly conclusions based upon such measurements. Two types of bottom-hole-pressure-measuring instruments are at present being used in the Beaumont division of the company. One instrument of each type was selected for a series of calibration tests; and, for the purposes of this report, the instruments selected will be referred to as Gage "A" and Gage "B." Gage A utilizes a bourdon tube as the pressure-measuring element, while Gage B employs a piston and spring as the measuring element.

Procedure

Both Gage A and Gage B were calibrated with a deadweight tester at temperatures of 73° (room temperature), 120° and 190° F. Pressure readings were taken in each case at 500-lb. pressure increments from 500 to 4,000 psi. with both increasing and decreasing pressures.

Two complete calibrations were run at 73° F. and four at 120° F. At 190° F., four calibrations were run on Gage B and five were run on Gage A.

All charts were measured with a chart-reading device, which provides a reading accuracy of ±0.001 in.

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THIS report was initially prepared to inform the company's production engineers and reservoir engineers of the capabilities of bottom-hole-pressure-measuring instruments now in use in the company, and to propose any changes in technique and construction deemed conducive to greater precision in measurements. Since many fields are produced by several operators, field-wide bottom-hole-pressure surveys are usually based on pressure measurements obtained with several different pressure gages. It is believed that the publication of reports of this kind will be in the interest of greater accuracy and uniformity in the conduct of such surveys.

Calculations

1. Equations.—The calibration data for each gage were plotted on graph paper sufficiently large to provide one graduation for each 5 psi. on the pressure scale and one graduation for each 0.005 in. of deflection on the other scale. From these curves, it was observed that the calibration data for Gage B traced a straight line, both for increasing and for decreasing pressures, and that Gage A traced a straight line for increasing pressures, but not for decreasing pressures.

The calibration curve for either gage was found to be very large and unwieldy if plotted to permit readings within the limits of precision of the pressure-measuring instrument. Hence, equations were computed to express the relationship between pressure and deflection, and between pressure, deflection and temperature for each instrument.

Table 1 shows the calibration data for Gage A at 190° F., and for increasing pressures.

TABLE 1

(1) Calibration pressure	(2) Deflection (in.)	(3) Calculated pressure	(4) Deviation		(1) Calibration pressure	(2) Deflection (in.)	(3) Calculated pressure	(4) Deviation	
			Plus	Minus				Plus	Minus
500	.220	502.3	2.3	...	2,400	1.060	2,397.8	...	2.2
500	.219	500.1	0.1	...	2,500	1.105	2,499.3	...	0.7
500	.222	506.8	6.8	...	2,500	1.103	2,494.8	...	5.2
800	.352	800.2	0.2	...	2,500	1.106	2,501.6	1.6	...
850	.372	845.3	...	4.7	3,000	1.327	3,000.3	0.3	...
1,000	.440	998.8	...	1.2	3,000	1.325	2,995.8	...	4.2
1,000	.439	996.5	...	3.5	3,000	1.328	3,002.5	2.5	...
1,000	.443	1,005.5	5.5	...	3,200	1.415	3,198.8	...	1.2
1,500	.662	1,499.7	...	0.3	3,200	1.416	3,200.1	1.1	...
1,500	.660	1,495.2	...	4.8	3,500	1.549	3,501.2	1.2	...
1,500	.662	1,499.7	...	0.3	3,500	1.547	3,496.7	...	3.3
1,600	.707	1,601.2	1.2	...	3,500	1.550	3,503.5	3.5	...
1,600	.705	1,596.7	...	3.3	4,000	1.770	3,999.9	...	0.1
2,000	.884	2,000.6	0.6	...	4,000	1.771	4,002.2	2.2	...
2,000	.882	1,996.1	...	3.9	4,000	1.770	3,999.9	...	0.1
2,000	.885	2,002.9	2.9	...	4,000	1.770	3,999.9	...	0.1
2,400	1.062	2,402.3	2.3	...	4,000	1.772	4,004.4	4.4	...
			(9)	(8)				(8)	(9)
22,250	9.816		21.9	22.0	55,800	24.684		16.8	17.1

Sum of deviations (regardless of sign) = 77.8.

$$\text{Average deviation} = \frac{77.8}{34} = 2.29 \text{ psi.}$$

90 per cent error = 2.29 × 2.08 = 4.76 psi.

Probable error = 2.29 × 0.8453 = 1.94 psi.

In order to develop an equation relating the stylus deflection and the pressure, it is assumed that the data will fit a straight-line curve, of the form $P = mD + b$, where m is the slope of the curve and b is its intercept on the pressure axis, P is the pressure in pounds per square inch, and D is the stylus deflection in inches. The validity of this assumption was demonstrated by plotting the

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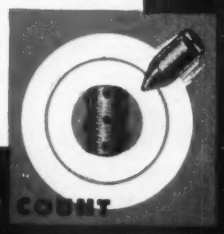

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data on graph paper as explained above.

To compute the constants "m" and "b," the series of pressure-deflection readings was divided into two equal groups (left and right sections of Table 1. For each group of data, the calibration pressures were added and the stylus deflections were added, to yield a combined equation. Thus, from the left section of the table the equation is:

$$22{,}250 = 9.816 + 17b \quad (1)$$

in which the coefficient of "b" is the number of independent readings involved.

For the right section of the table the equation is:

$$55{,}800 = 24.684m + 17b \quad (2)$$

By subtracting Equation 1 from Equation 2, we obtain:

$$33{,}550 = 14.686m$$
$$m = 2{,}256.5$$

Substituting the value of m into Equation 2, we obtain:

$$55{,}800 = (2{,}256.5)\ (24.684) + 17b$$
$$= 5.9$$

Thus the equation relating pressure and deflection at 190° F. is:

$$P\ (@190°) = 2{,}256.5D + 5.9 \quad (3)$$

In like manner, equations were computed to express the relationship between pressure and deflection at 73° F. and at 120° F.

For Gage A, these equations were:

$$P\ (@120°) = 2{,}284.6D + 11.4 \quad (4)$$

$$P\ (@\ 73°) = 2{,}303.5D + 3.3 \quad (5)$$

For readings at intermediate temperatures, the range 120° to 220° is separated into two parts and one equation computed for the range 120° to 155° F. and another for the range 155° to 220° F. For the range 155° to 220° F., the 190° F. equation (Equation 3) is used as the base equation. To this a temperature correction factor is applied by dividing the difference in the slope or "m" values of the 190° F. and the 120° F. equations by the difference in temperature (70°). Thus:

$$\frac{2{,}284.6 - 2{,}256.5}{70} = 0.401 \text{ per °F.}$$

Thus the equation becomes:

$$P_T = (2{,}256.5 + 0.401\Delta t)\ D + 5.9 \quad (6)$$

For the range 155° to 190° F.

Where:

$\Delta t = 190 - T$

T = observed temperature

For the range 120° to 155° the equation becomes:

$$P_T = 2{,}284.6 + 0.401\Delta t)\ D + 11.4 \quad (7)$$

Where:

$\Delta t = 120 - T$

2. Deviations.—After computing the equations for each temperature, the pressure corresponding to each observed deflection was calculated from the equations and these values tabulated (see Column 3, Table 1). The positive and negative deviations of these computed pressures from the calibration pressure were then tabulated (see Column 4, Table 1).

To compute the average deviation of a single reading from the accepted value, the deviations were added, regardless of sign, to obtain a value of 77.8 in the example shown. The sum of the deviations is then divided by 34 (the number of independent observations) to obtain an average deviation of 2.29 psi.

From the theory of probability, equations have been developed to determine the probable error and the 90 per cent error from the average deviation. The probable error, "r," is defined as an error such that the number of errors which are greater than r is equal to the number of errors less than r.

The probable error may be computed by the following equation:

$$r = (0.8453) \text{ average deviation}$$

For example case, the probable error:

$$r = (0.8453)\ (2.29) = 1.94 \text{ psi.}$$

The 90 per cent error is defined as that error which will be exceeded in only 10 per cent of the tests. The 90 per cent error may be computed by the following equation:

$$90\% \text{ error} = (2.08) \text{ (avg. deviation)}$$

For the example case, the 90 per cent error is:

$$90\% \text{ error} = (2.08)\ (2.29) = 4.76 \text{ psi.}$$

Recommendations

1. The number of calibration tests included in this report is probably too small to establish the average deviation and 90 per cent error with precision. Hence, it is recommended that future routine calibration data be checked against these equations and the deviations computed. If the sum of the positive deviations does not differ from the sum of the negative deviations by more than 2.5 psi. per reading, then the new data should be averaged with the present data to compute a new equation.

If the difference in the sum of the deviations does exceed 2.5 psi. per reading, a complete recalibration should be made. A recalibration should consist of a minimum of three runs at each end of the temperature range in which the gage is to be used.

2. The longer stroke of the stylus on Gage B as compared to that of Gage A has a distinct advantage in that an error of 0.001 in. in reading the stylus deflection represents an error of approximately 0.81 psi. on Gage B as compared to 2.26 psi. on Gage A. However, the variation in the frictional forces in the packing gland on Gage B overbalances this inherent advantage. It is recommended that a neoprene "O" ring packing element be constructed for Gage B and additional calibrations run. It is possible that an improved packing element design might reduce the 90 per cent error of Gage B to a value equal to or even less than that of Gage A.

3. In view of the fact that the calibration curve for Gage A under conditions of decreasing pressure does not follow a straight line, it is recommended that no readings be taken

TABLE 2 LISTS THE EQUATIONS, THE AVERAGE DEVIATIONS, THE PROBABLE ERRORS, AND THE 90 PER CENT ERRORS FOR GAGE A AND GAGE B AS DETERMINED IN THESE TESTS

Type gage	Pressure	Temp.	Equation	Avg. dev.	P.E.	90% error
Gage A	Increase	73° F.	$P\ (@\ 73°) = 2{,}303.5D + 3.3$	3.61	3.05	7.51
Gage A	Increase	120° F.	$P\ (@\ 120°) = 2{,}284.6D + 11.4$	2.91	2.46	6.05
Gage A	Increase	190° F.	$P\ (@\ 190°) = 2{,}256.5D + 5.9$	2.29	1.94	4.76
Gage B	Increase	73° F.	$P\ (@\ 73°) = 822.7D + 285.3$	4.03	3.41	8.38
Gage B	Increase	120° F.	$P\ (@\ 120°) = 814.8D + 287.5$	4.91	4.15	10.20
Gage B	Increase	190° F.	$P\ (@\ 190°) = 801.1D + 291.4$	4.21	3.56	8.75
Gage B	Decrease	73° F.	$P\ (@\ 73°) = 816.6D + 269.8$	1.54	1.30	3.20
Gage B	Decrease	120° F.	$P\ (@\ 120°) = 812.9D + 273.8$	3.22	2.72	6.70
Gage B	Decrease	190° F.	$P\ (@\ 190°) = 799.6D + 268.0$	4.98	4.21	10.36

Note: Gage A calibration on decreasing pressure does not follow a straight line. Do not use.

TABLE 3 LISTS THE EQUATIONS TO BE USED FOR COMPUTING PRESSURES AT TEMPERATURES OTHER THAN THE CALIBRATION TEMPERATURES

Type gage	Pressure	Temp.	Equation	Δt
Gage A	Increase	70-95	$P_T = (2{,}303.5 + 0.4021\ \Delta t)\ D + 3.3$	73-T
Gage A	Increase	95-120	$P_T = (2{,}284.6 + 0.4021\ \Delta t)\ D + 11.4$	120-T
Gage A	Increase	120-155	$P_T = (2{,}284.6 + 0.4014\ \Delta t)\ D + 11.4$	120-T
Gage A	Increase	155-220	$P_T = (2{,}256.5 + 0.4014\ \Delta t)\ D + 5.9$	190-T
Gage B	Increase	70-95	$P_T = (822.7 + 0.1681\ \Delta t)\ D + 285.3$	73-T
Gage B	Increase	95-120	$P_T = (814.8 + 0.1681\ \Delta t)\ D + 287.5$	120-T
Gage B	Increase	120-155	$P_T = (814.8 + 0.19570\ \Delta t)\ D + 287.5$	120-T
Gage B	Increase	155-220	$P_T = (801.1 + 0.1957\ \Delta t)\ D + 291.4$	190-T
Gage B	Decrease	70-95	$P_T = (816.6 + 0.0787\ \Delta t)\ D + 269.8$	73-T
Gage B	Decrease	95-120	$P_T = (812.9 + 0.0787\ \Delta t)\ D + 273.8$	120-T
Gage B	Decrease	120-155	$P_T = (812.9 + 0.190\ \Delta t)\ D + 273.8$	120-T
Gage B	Decrease	155-220	$P_T = (799.6 + 0.190\ \Delta t)\ D + 268.0$	190-T

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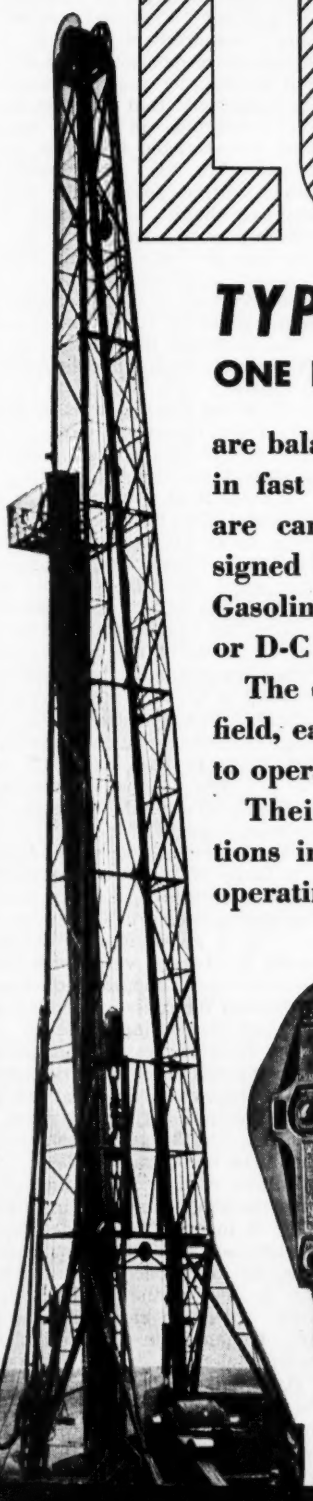

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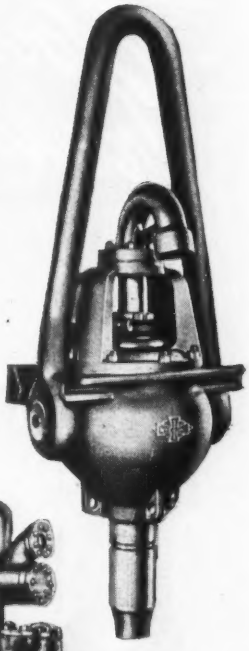

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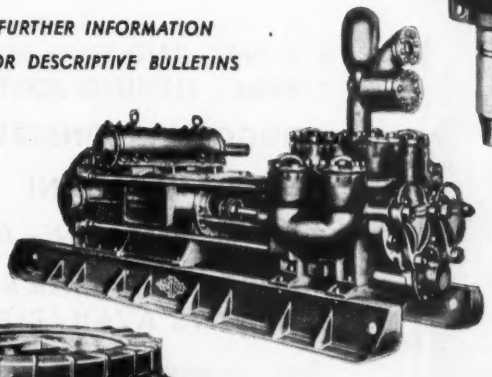

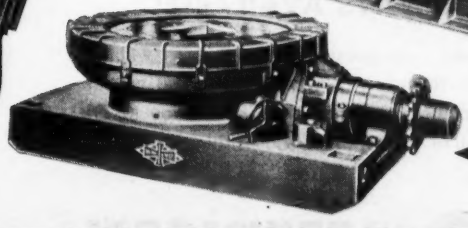

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while coming out of the hole when using Gage A.

Conclusions

1. The use of an equation computed from calibration tests for calculating pressures from the chart deflection has certain advantages over the use of curves for obtaining the pressure. The equation will give more accurate results than curves unless exceedingly large and cumbersome charts are prepared. The correction for differences between bottom-hole temperatures and calibration temperature may be readily incorporated in the equation without resorting to additional curves or computation.

2. Gage A, at temperatures between 120° and 220° F., will measure pressures up to 4,000 psi. (using the 4,500 psi. element) with an average deviation from the true pressure of approximately ±3.0 psi., and 90 per cent of all readings taken should be within ±6 psi. of the correct value, provided the temperature at which the reading is taken is known precisely.

3. The temperature coefficient of Gage A in the range between 120° and 220° F. is approximately 0.4 psi. per °F. per inch of stylus deflection. At 4,000 psi. this would correspond to a pressure error of approximately 0.7 psi. per °F. of error in temperature measurement. Hence, precise temperature measurements are essential to accurate pressure readings. It is suggested that all temperature measurements on each individual well be averaged to obtain the true temperature. Also, any measurements which differ appreciably from the average should be rejected. A rule which may be employed to determine whether or not a reading should be rejected is as follows:

(a) Average all temperature readings excluding the doubtful reading.

(b) Compute the average deviation of these readings from the mean temperature.

(c) If the questionable reading differs from the mean value by more than five times the average deviation, it should be rejected.

4. Gage B, at temperatures between 120° and 220° F., will measure pressures up to 4,000 psi. (using the 4,500 psi. spring) with an average deviation from the true pressure of approximately ±5.0 psi., and 90 per cent of all readings should be within ±10.5 psi. of the true value, provided the temperature at which the reading is taken is known previsely.

5. The temperature coefficient of Gage B in the range between 120° and 220° F. is approximately 0.20 psi. per °F. per inch of stylus deflection. At 4,000 psi. this would correspond to a pressure error of 0.89 psi. per °F. of error in temperature measurement.

6. Gage B follows a straight-line calibration under both increasing and decreasing pressures. However, there is a lag of approximately 40 psi. between the two curves, which necessitates the use of separate equations for computing the pressure under increasing and decreasing pressure conditions. It is suggested that pressures be computed under both conditions, and if the two pressures at any given depth should differ by more than 10.5 psi. (the 90 per error), the gage should be recalibrated.

7. It is recommended that an "O" ring packing gland be installed on Gage B in an effort to decrease the lag between the deflections under increasing and decreasing pressures, and to reduce the tendency of the gage to drift in calibration as a result of changes in the friction of the packing element.

It is realized that perhaps many of the recommendations brought out in this report have been previously investigated by other operators; in fact, it is known that the recommended change in construction of Gage B is at present in use by some operators.

References

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Sherwood and Reed, "Applied Mathematics in Chemical Engineering," Chapter 9, McGraw-Hill Book Co., 1939.

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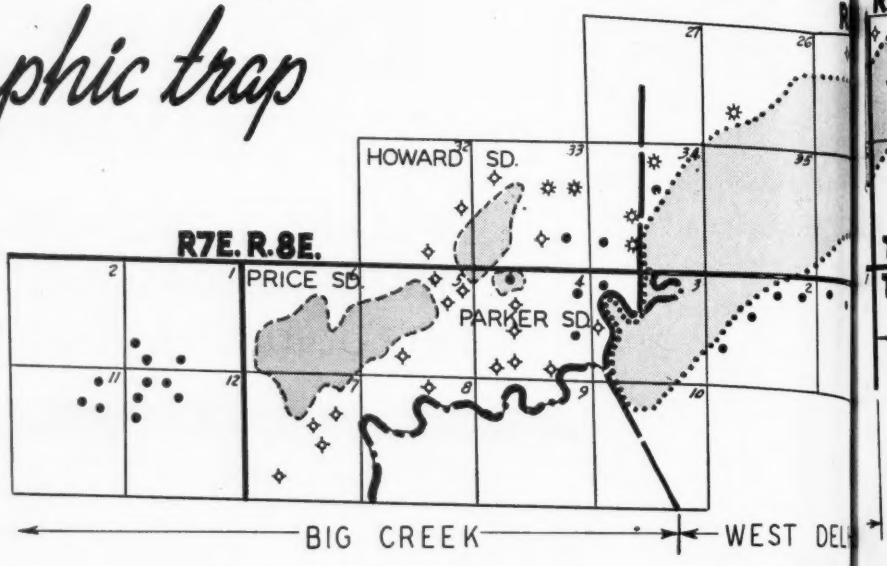


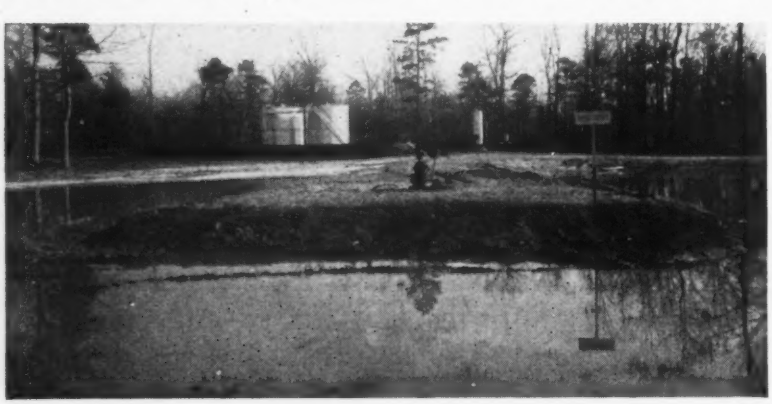
LOUISIANA'S largest oil field, Delhi-Big Creek, also represents the most important oil-producing stratigraphic trap to be discovered in this country since East Texas. Its 2½-year history of development is marked by a sustained drilling program and mounting withdrawals which currently far exceed oil production from any other Louisiana field. Cumulative production exceeded 10,000,000 bbl. early in April 1947.

In addition to its importance from the standpoint of new domestic oil reserves, the discovery has encouraged geologists in their search for new fields of that type. Discovery of oil at Delhi followed years of detailed subsurface study of the region surrounding the Monroe uplift-Sharkey platform in Louisiana, Arkansas, and Mississippi. This basic work in which many geologists participated, and the intensive study given the south edge of the uplift, is given full credit for the major discovery.

Several wildcat failures were drilled in the general area before C. H. Murphy, Jr., and Sun Oil Co., on December 9, 1944, completed 1 J. E. Holt, the Delhi discovery well. The well flowed 218 bbl. daily through perforations in the Holt sand member of the Paluxy formation at 3,280-90 ft.

The ensuing drilling play which followed a general northeast-southwest trend paralleling the line of Tuscaloosa truncation on the uplift's south edge, resulted in extension of Holt sand production and discovery of many additional oil and gas sands in Delhi, West Delhi, and Big Creek fields. The three fields were named before their several producing sands were known to overlap in a continuous producing area extending 18 miles through three parishes. At present, Delhi and West Delhi are classed as one field, and Big Creek, although it adjoins West Delhi, is considered separate, since it produces from different sands.

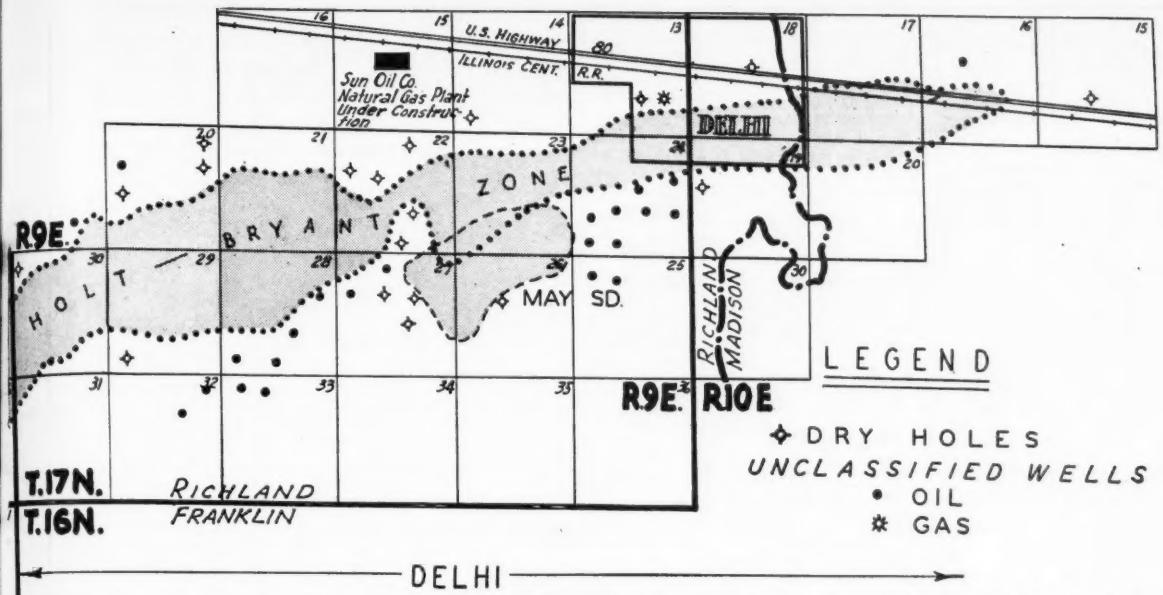
In the absence of high pressures, surface connections are relatively simple. This typical well location illustrates problem of surface water, which becomes acute during rainy season



A total of 331 wells, including 15 shutin gas wells, had been completed by the end of the first quarter of 1947 and the producing area of the group of fields is now fairly well defined. As a result, drilling on the 40-acre spacing pattern has declined since the first of this year, and the area is entering its settled-production phase. Daily oil production may be expected to continue at the rate of about 25,000 to 30,000 bbl. for the next several months.

A 15,000,000-cu.-ft. natural-gasoline plant is now under construction in the field. Operated by Sun Oil Co., its gathering system will serve the entire area. Completion of the plant is scheduled for the first quarter of 1948. Contracts for sale of residue gas for pipe-line transmission are now being negotiated.

Geologically, the Delhi-Big Creek

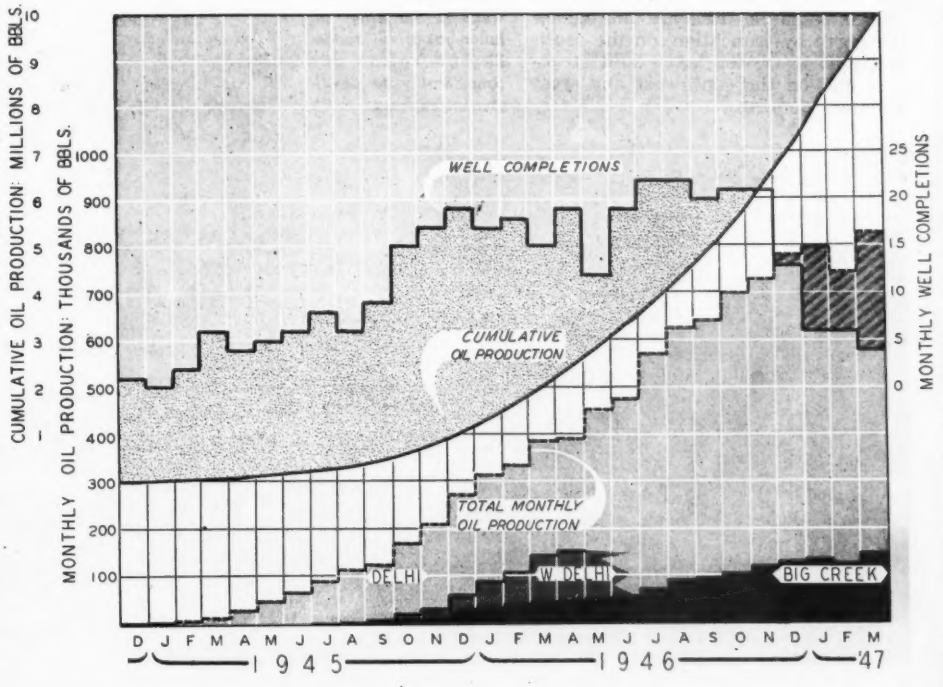


Production extends about 18 miles from Big Creek to Delhi. Shaded areas include wells producing from Holt-Bryant and other named zones in the field group. Wells outside these areas are producing from sands as yet largely unclassified. Boundaries between fields follow section and creek lines

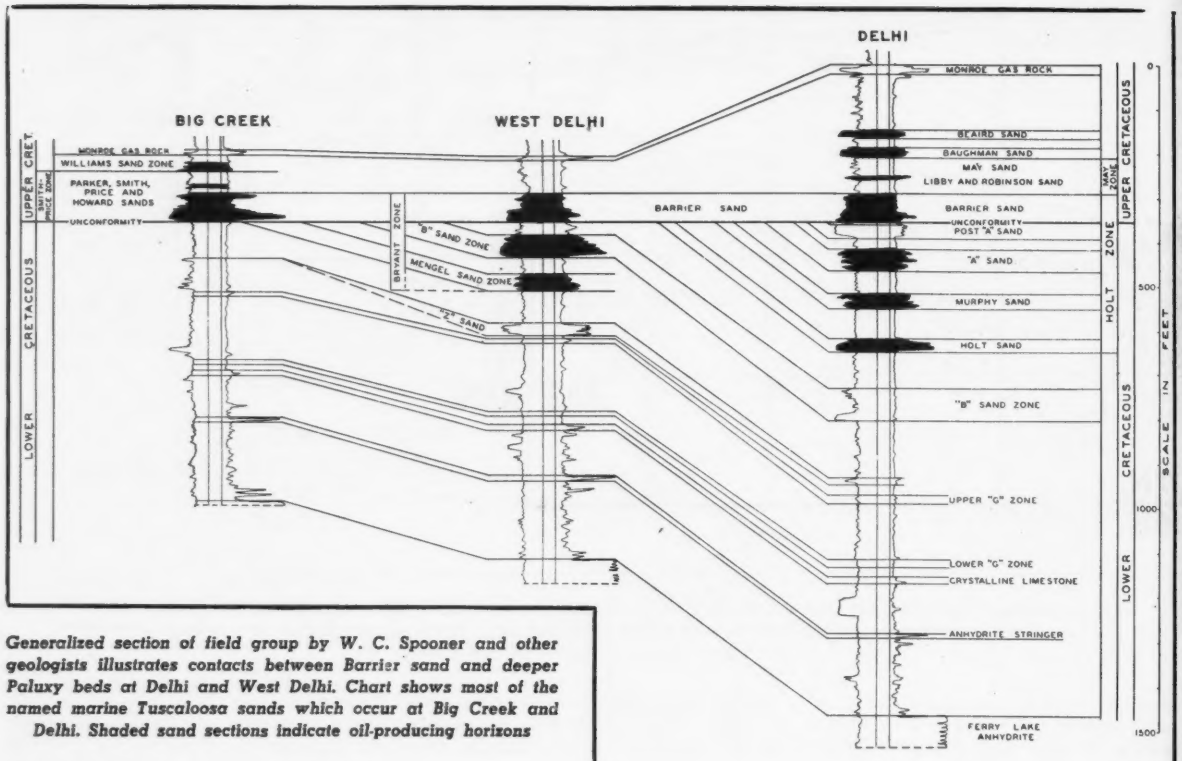
area is greatly complicated by unconformities. The major upthrust which formed the Monroe Uplift-Sharkey platform began near the close of the Lower Cretaceous period and continued into the Early Tertiary period. On the south edge of that uplift near Delhi, warping of the sea floor raised Cretaceous beds above the water level and their subsequent erosion formed the source rock for offshore deposition of Tuscaloosa beds. Uplift was greater on the west at Big Creek, where both basal Tuscaloosa and Paluxy sands were completely eroded, and marine Tuscaloosa sands were laid down directly over upper Glen Rose.

The erosional truncation of basal Tuscaloosa, Paluxy, and upper Glen Rose beds, and the depositional truncation of marine Tuscaloosa sands along the ancient shore line, the latter overlain unconformably by the locally impervious Monroe gas rock, formed the traps into which oil and gas later migrated.

A large unconformity exists between the base of the Tuscaloosa (Upper Cretaceous) and the Paluxy (Lower Cretaceous). Since Paluxy beds dip southeastward at a greater rate than the porous basil Tuscaloosa member, locally termed the Barrier sand comes into direct contact with various truncated Paluxy beds along the trend. Thus the Barrier sand and several Paluxy sands including the Paluxy "A," Murphy, Holt, and sands of the Bryant zone, are contiguous. Since the Barrier sand is continuous throughout Delhi and West Delhi, it joins all


CUMULATIVE OIL PRODUCTION: MILLIONS OF BBLS.
MONTHLY OIL PRODUCTION: THOUSANDS OF BBLS.
MONTHLY WELL COMPLETIONS
WELL COMPLETIONS
CUMULATIVE OIL PRODUCTION
TOTAL MONTHLY OIL PRODUCTION
DELHI
W. DELHI
BIG CREEK
D J F M A M J J A S O N D J F M A M J J A S O N D J F M
1945
1946
47

Steadily mounting production from the Delhi-Big Creek area reflects the sustained development of the field group during the past 2½ years. With most of the proven area now drilled, production may be expected to level off between 25,000 and 30,000 bbl. daily. The best wells in the field are those producing from the Holt-Bryant zone, which average about 100 bbl. each, per day

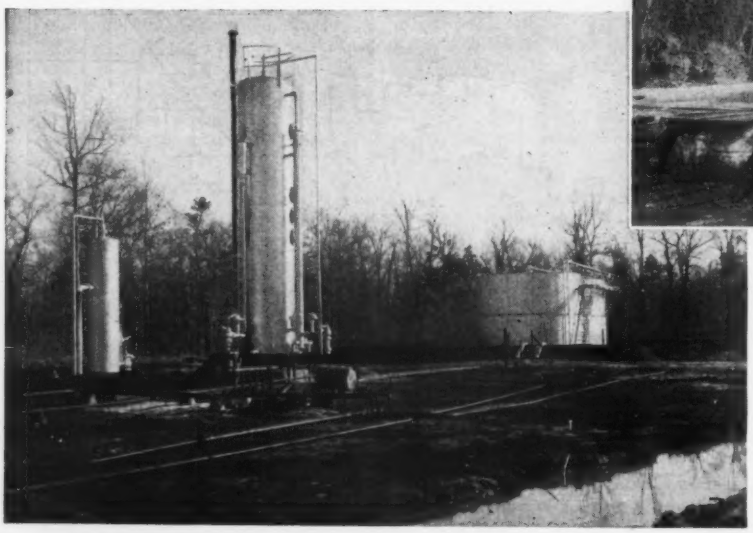


Generalized section of field group by W. C. Spooner and other geologists illustrates contacts between Barrier sand and deeper Paluxy beds at Delhi and West Delhi. Chart shows most of the named marine Tuscaloosa sands which occur at Big Creek and Delhi. Shaded sand sections indicate oil-producing horizons

such sands into a common reservoir showing a similar water level and other like reservoir characteristics. This reservoir which contains over 80 per cent of oil reserves in place in the field group, is termed the Holt-Bryant zone.

A number of smaller marine Tuscaloosa stray sands, many of them unclassified, produce oil and gas over the area. They are primarily solution gas drive type reservoirs. In general, all sands in the area are limited on the north by truncation, on the south and east by water levels and structure and on the southwest and west by lateral lensing.

Right: Pumps are installed on few wells to date, although pump or other artificial-lift equipment will soon be required for many edge wells in the stray, solution-gas-drive sands. Elevated roads add considerably to development expense



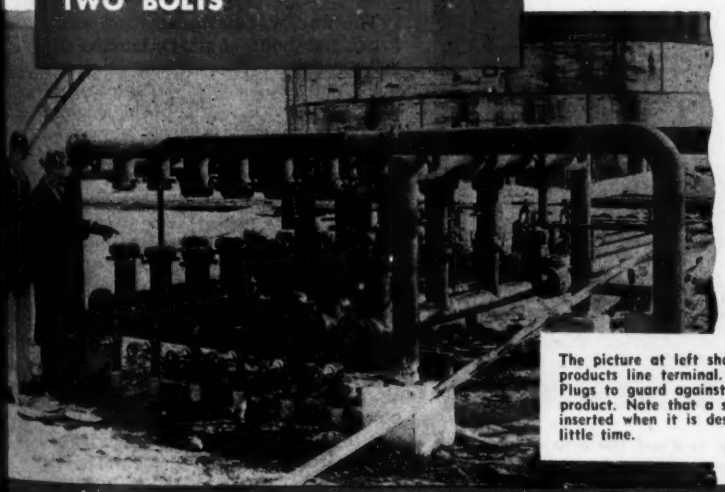
Left: Conventional treaters easily handle production from minority of leases now producing water with oil

This important oil development has incited much further interest in subsurface geology in the region outlining the major uplift. Further exploration both north and south of the Delhi area has resulted in additional oil discovery although none to date

(Continued on page 126)

A "PLUG" FOR PIPELINERS

UNIBOLT Pipeline Couplings with Blanking Plugs—they're light-weight, easy to install and remove, and leak-proof under all conditions.



For years pipeliners have been straining to lift heavy blind flanges on and off scraper traps, breaking out and making up the time-consuming multi-bolt connections with each operation. Threaded bull-plugs in this service have proven troublesome, too, because they frequently leak after being broken out a few times.

So, naturally, when UNIBOLT offered a coupling for that service that has no threads or flanges and can be assembled or dismantled by simply tightening one bolt (two bolts on sizes over 6-inch) the pipeliners were interested. Obviously, assembling and dismantling is quick and easy as compared with the old-style method, and the renewable resilient ring gasket in the UNIBOLT Coupling assures a pressure-tight seal under all conditions.

The picture at left shows a large number of UNIBOLT Pipeline Couplings in service on a products line terminal. In this instance, the lines are blanked off with UNIBOLT Blanking Plugs to guard against one liquid product leaking thru a valve and contaminating another product. Note that a spool, or short length of pipe with UNIBOLTS on both ends, must be inserted when it is desired to open any line for flow. This operation is easy and requires little time.

THORNHILL-CRAVER COMPANY UNIBOLT THE ONE BOLT COUPLING **HOUSTON, TEXAS**

Pilot Plant Aids Operation Of Furfural Extraction Unit

*by Louis C. Br wn**

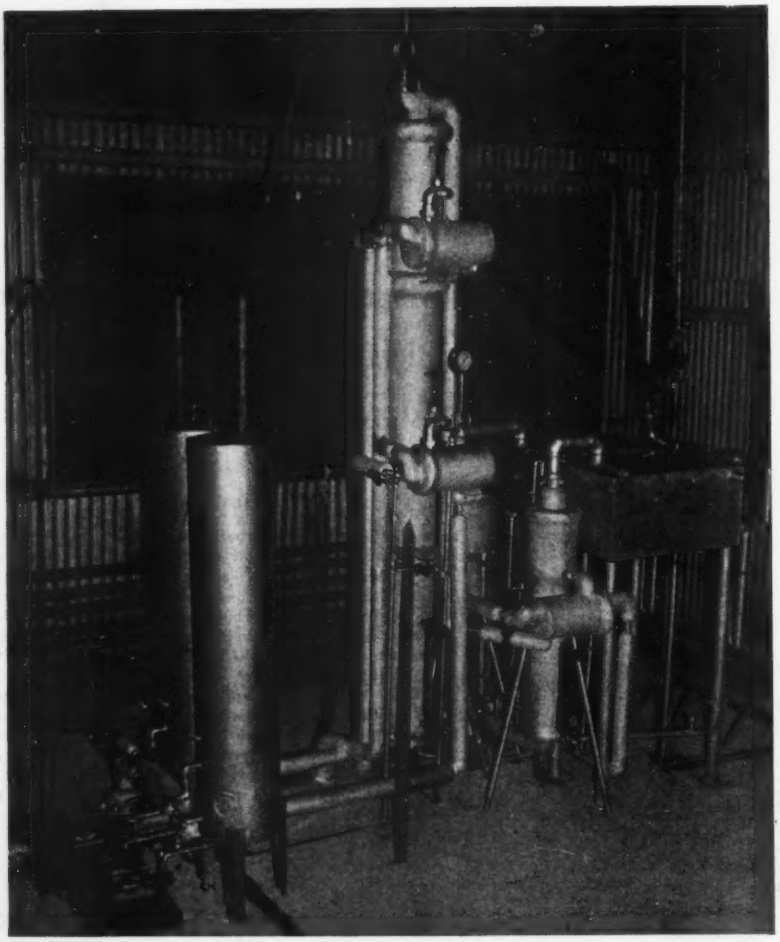
THIS report will discuss the purpose, design, and operation of a furfural solvent-refining pilot unit that has been constructed and is now operating at the Cooperative Refinery Association plant at Coffeyville, Kans. It is, of course, in no sense the completely instrumented and specially equipped unit as might be expected in a fully developed research organization but—for the purpose behind its construction—it has more than paid out the nominal construction and operating cost. It is also intended herein to point out the many advantages that may be derived from such small installations previous to the completion date of a commercial unit being erected by the refiner.

Shortly after the contractual negotiations between the Cooperative Refinery Association and Texaco Development Co. were completed, there followed the usual demands for information covering the range from operating data to a heavy volume of finished oil samples. At first, specification made from the performance data supplied by the licensor combined with numerous "batch" extractions by our laboratories appeared to be sufficient.

The original plan was to fit the new unit into our lube-processing plan between distillation of conventional treated solutions and the percolation filters, so that when conventional lubes were to be made the furfural treating would be bypassed. The operation division, however, was not long in proposing numerous other processing schemes, some of which while theoretically sound would require a small unit to prove them.

The refinery engineering department was finally requested to design a pilot plant which would provide ample quantities of 95-viscosity stocks for further test work and for blending up sample specimens of anticipated solvent-treated motor oils. The small plant was to be so designed that treating conditions would approach actual operations, and that the raffinate and extract be removed from the unit solvent free.

In addition to the information on quality, yields of raffinate and extract, and operating conditions, it would provide an excellent supplement to classroom training when operating personnel for the new unit were selected. Finally, it would provide quantities of extract for our research division to investigate other possible uses rather than disposing of it as fuel oil.



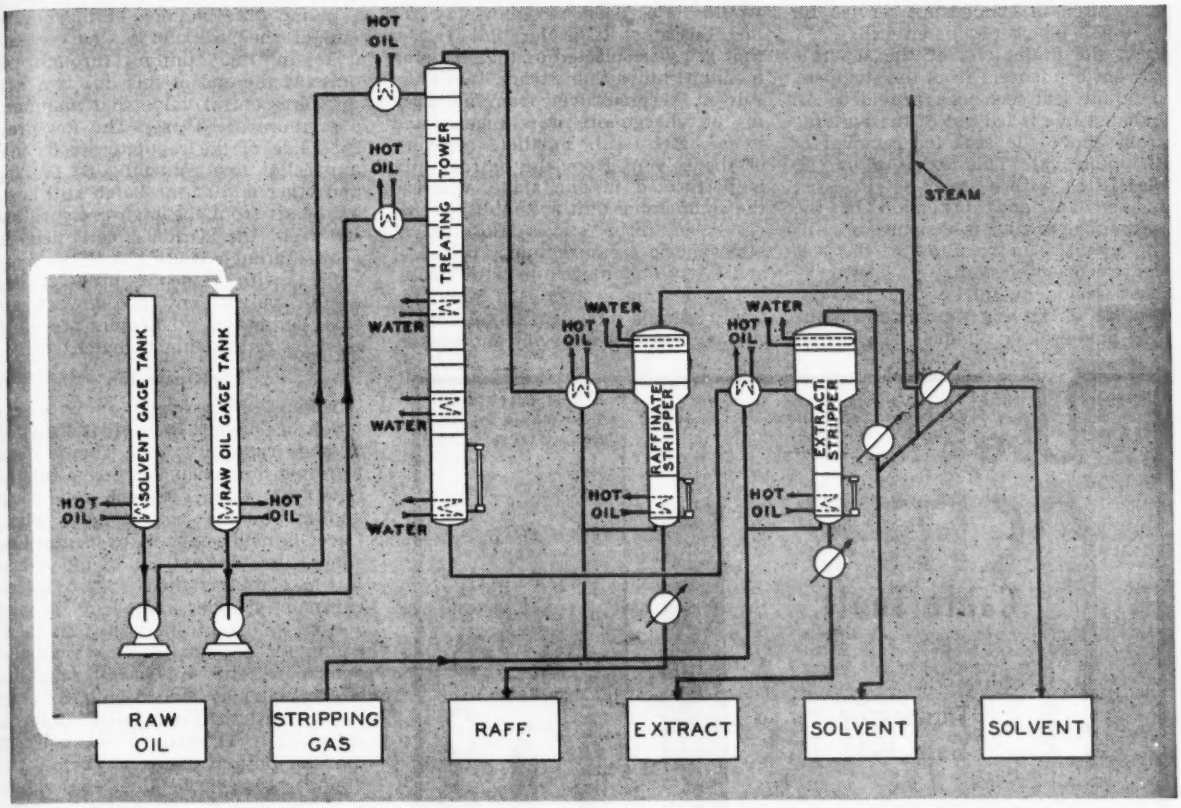
This furfural treating pilot plant operates on a feed charge of 5 gal. per hour. Solvent gage tank is on the left behind the raw-oil gage tank and the treating tower and strippers are near the center of the photograph. Condenser coils are in the open box at the right. Stripper for raffinate is in the foreground between treating tower and condenser box

Design of Plant

The unit was designed to discharge 5 gal. per hour of an Oklahoma City 200-viscosity S.S.U. at 100° F. neutral oil when using a 2 to 1 solvent ratio. The treating column itself is somewhat oversized, because it was felt that increased contact (increased theoretical extraction stages) would make up for a lack of recycling a portion of extract. Yield data, upon operation of certain stocks evaluated by the licensor, approaches nearly the yield offered by the latter.

Cost of construction amounted to $700, most of which was labor. The only new equipment required was three Viking gear pumps: the first—½ g.p.m.—charges the raw oil; the second—½ g.p.m.—charges the treating tower with furfural solvent; and the third—10 g.p.m.—circulates the

*Chief refinery engineer, Cooperative Refinery Association, Coffeyville, Kans.



Flow diagram of furfural treating pilot plant of Cooperative Refinery Association, Coffeyville, Kans.

hot oil through the heating system. The motors used to drive the pumps had been previously reconditioned and were a part of our spare-parts inventory. Valves, fittings, and a back-pressure regulating valve were obtained from the salvage shop.

The two gage tanks were constructed from 10-in. pipe and are 5 ft. in height. Each is equipped with a heating coil in the bottom section. While the coil was not so essential in the solvent tank, it was necessary in the case of the raw-oil tank when operating on wax distillate or high-viscosity materials.

The treating tower was fabricated from short lengths of 6-in. pipe and its average height is 9 ft. The sections, as shown in the flow diagram, are 4-in. beds of ¼-in. carbon raschig rings. It is also equipped with cooling coils in the lower section to effect a temperature differential throughout the treating vessel. The solvent and raw-oil charge heaters were fabricated from 4-in. pipe as the shell inside of which is a ¼-in. heating coil.

The raffinate stripper is 8 by 10 by 4 in. by 3 ft. 4 in. The section above vaporizer is packed with ¼-in. raschig rings and equipped with a cooling coil to serve as reflux. The stripping section is also packed with ¼-in. raschig rings, and equipped with a hot-oil coil at the bottom which serves as a reboiler to maintain bottom temperature. The raffinate-mix preheater is constructed similar to the aforementioned heaters. The bottom of the stripper and the preheater is equipped with a distribution arrangement for admission of fuel gas as a stripping medium.

The extract stripper is similar to the raffinate stripper except that the fractionation section is made of 10-in. pipe and the stripping section of 3-in. standard pipe. The preheater offers considerably greater surface due to the large volume of solvent to be vaporized. The condenser coils are open box type and had formerly

TABLE 1—OPERATION OF AND RESULTS FROM FURFURAL SOLVENT EXTRACTION PILOT PLANT

Operating conditions—	Column 1 Oklahoma City crude bright stock	Column 2 Oklahoma City crude special stock
Raw oil to treating tower, °F.	300	275
Solvent to treating tower, °F.	300	250
Solvent: oil ratio	2.0	3.0
Treating-tower top, °F.	270	224
Treating-tower middle, °F.	230	195
Treating-tower bottom, °F.	200	170
Raffinate mix to stripper, °F.	375	415
Raffinate stripper top, °F.	287	301
Raffinate stripper bottom, °F.	409	420
Extract mix to stripper, °F.	389	420
Extract stripper top, °F.	294	323
Extract stripper bottom, °F.	395	410
Solvent in raffinate, per cent	10	10
Solvent in extract, per cent	90	90

Laboratory inspection—	Raw stock	Raffinate	Extract	Raw stock	Raffinate	Extract
Gravity, °A.P.I.	23.9	25.2	12.5	26.6	30.7	10 8
Flash, °F.	530	535	490	405	420	385
Fire, °F.	605	610	565	460	485	460
Visc. at 100° F., S.S.U.	3,350	2,855	28,907	217	194	1,194
Visc. at 210° F., S.S.U.	163	156	313.4	45.9	45.8	60.5
Viscosity index	83.9	90.5	—27.5	73.9	95.0	—111.7
Cloud, °F.	....	....	....	10	10	....
Pour, °F.	25	25	50	5	10	10
Color, A.S.T.M.	7—	6½	3½ (½mm.)	3½	2—	4+
Con. carbon res., per cent	1.60	1.17	5.04	0.02	0 005	0.49
Sligh oxidation	....	....	....	60.2	12.0	....
Neutral No.	....	....	....	0.025	0.02	0.08
Demulsion at 180° F.	....	....	....	....	1,620	....
Yield vol., per cent	100.0	89.0	11.0	100.0	83.0	17.0

been used in condensing service for a 10-gal. laboratory batch still.

At the outlet end of the separate solvent condensers from the strippers, a liquid seal has been provided. An exhaust line is led out of the building from above the seal for removal of stripping gas. This exhaust line is also fitted with a steam jet to assist in removal and dispersion of the stripping gas and is capable of pulling about 5-in. vacuum on the solvent-recovery system.

As is evident, this system does not provide for drying the furfural. This was deliberately planned as the unit would have been too unwieldy for one operator. It is for this reason that gas was selected as the stripping medium rather than steam. When the solvent becomes wet from moisture in the charge oil, it is regenerated in a batch still. Further, recovery of the solvent from the extract mix is performed in one stage, whereas the commercial unit accomplishes this result in three stages—flashing at atmospheric pressure, under pressure, and lastly under vacuum with steam.

The heating system is a comparatively simple one. A 20-gal. batch still is used as a reservoir and heater. A pump takes suction at the bottom end of the still and discharges into a 1½-in. line running through the unit. At the end of this line is a lock pressure-control valve that maintains a pressure of 50 psig. The low-pressure side of the regulator feeds into a parallel line returning to the top and other end of the batch still heater. Leads from the high-pressure hot oil feed the various coil heaters. Flows through heating coils are controlled with Hancock proportioning needle valves on the downstream side. Outlets of all heaters are gathered by return line to batch still.

The Operation

The unit is warmed up by circulation of solvent. Raw oil is then fed to the treating tower. There is no raffinate mix taken off the tower top until the extract-solvent mix level appears in the bottom gage glass. Level is held constant by controlling charge to the extract stripper and raffinate mix is then started to the raffinate stripper. Flow of oil and solvent is controlled by frequent gaging of storage tanks which also determines the solvent oil ratio desired. Water is turned into the two water coils in furfural column to maintain a 60° differential between top and bottom of vessel. Below the upper cooling coil, the temperature is maintained at 30° below top temperature.

Flow to stripper is by pressure head on treating column. The overhead material—raffinate containing approximately 10 per cent solvent—charges the stripper after flow through preheater. The furfural is removed overhead, through condenser box, and collected in receiver wherefrom it is manually returned to the solvent gage tank at intervals. The raffinate is removed continuously through a cooler from the stripper bottom, keeping a constant bottom level therein. The stripping gas is removed by the exhaust pipe to a safe point above building before release to atmosphere. Solvent is removed from extract mix in the same procedure as outlined above.

Data on two test runs are given in Table 1. Operating data and laboratory inspection data given under Column 1 in the table cover a run on bright stock produced from Oklahoma City crude oil. Data in Column 2 were obtained from a test run to produce a 185-viscosity (minimum) neutral. The bright-stock charge was given previous treatment which included cold acid deasphalting and dewaxing and clay contacting. Raw oil charged to the pilot plant to produce the 185-viscosity neutral was a residue product obtained by distilling a raw dewaxed solution prepared by chilling and pressing a 130-S.S.U. at 100° F. light wax distillate which had been diluted with 15 volume per cent naphtha.

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(1st) All billets must meet Acme's rigid analysis specifications. A range of over 5-points (not the mill's usual 10) and a shipment is refused. This exactness cost us extra. But it simply means your EXTRA protection "down hole."

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* * *

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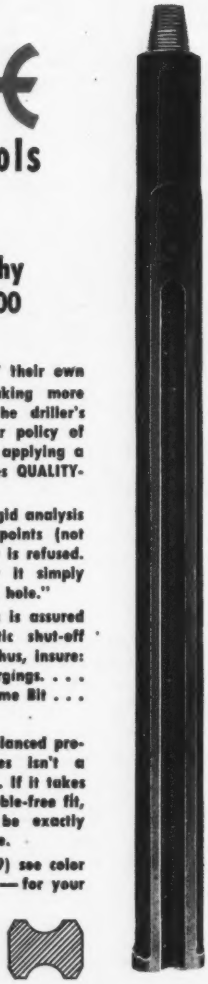

End View

Fig. 109 Acme Drilling Bit

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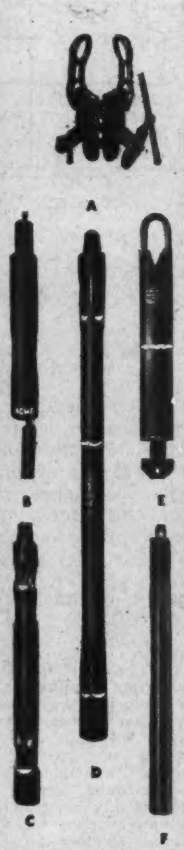

A—Wire Line Clamp, 12"
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QUESTIONS on TECHNOLOGY

by W. L. Nelson

Consulting Engineer

References—L.P.G. Business

Will you please send me references on the manufacture of bottle gas, particularly propane or its liquefication? I am also interested in the storage, delivery and uses. Which companies manufacture bottle gases?—D. V.

Most of the important publications about liquefied petroleum gases since about 1929 are listed in Petroleum Bibliography No. 19 of the Tulsa Public Library Technical Department. It was last brought to date in 1945 and it lists over 350 references.

A. T. Coumbe, Petroleum Economics Division, Economics and Statistics Branch, U. S. Bureau of Mines, lists the 118 companies that reported themselves to the Bureau of Mines as manufacturers of liquefied petroleum gases (Petroleum Engineer, March 1946, p. 299). Undoubtedly there are many more operators, and of course there are hundreds if not thousands of distributors.

Manufacture

Little appears in the literature that directly pertains to manufacture. The reason for this lack is the fact that the operation of a natural-gasoline plant or hydrocarbon-fractionation plant is intimately interwoven with bottle-gas manufacture. In other words, liquefied petroleum gases are a natural byproduct of natural gasoline (or refinery) stabilizers. Obviously, the manufacture of bottle gases involves first of all the absorption of propane, isobutane, butane, etc., into an absorption oil, and finally a series of fractionators (or stabilizers) by which the propane, butanes, etc., are separated from one another. If it is desired to absorb substantially all of the propane from a gaseous mixture, either refrigeration or a very high pressure must be employed. The numerous references to natural-gasoline or stabilization cannot be listed here, but a few modern references are:

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9. Short, E. H., Cycling Plant Designed for Obtaining High Percentage of Propane and Butane, The Oil and Gas Journal, Mar. 16, 1944, p. 67.

10. Anon., Pressure Distillate Stabilizer and Butane Recovery Unit Come Out of Junk Heap, Pet. Refiner, Jan. 1944, p. 119.

11. Foster, A. L., Lone Star's Central Fractionator Concentrates on Special Products, The Oil and Gas Journal, Aug. 29, 1943, p. 74.

12. Harts, H. W., Close Fractionation Needed to Recover Isomers from Gas, The Oil and Gas Journal, Apr. 24, 1941, p. 41.

13. Givens, H. C., Fractionating Equipment for Obtaining Special Products in Natural Gasoline Plants, Pet. Engineer, Nov. 1936, p. 51.

14. Nelson, W. L., Isolation of Hydrocarbon Stocks . . ., The Oil and Gas Journal, Jan. 8, 1942, p. 38.

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16. Nelson, W. L., Cost of Separating Isobutane from Gas, The Oil and Gas Journal, Nov. 7, 1940, p. 58.

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Properties

Having separated relatively pure hydrocarbon products, the blending, storage specification, etc., of them depends upon their physical properties and behavior. Accordingly, the following references pertain to such considerations:

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2. N.G.A.A., L.P.G. Specifications and Test Methods, Nat. Gaso. Asso. of Am., Kennedy Bldg., Tulsa, Okla., 1940.

3. N.G.A.A., Volume Correction and Specific Gravity Conversion of L.P.G. and Volatile Gasolines, Nat. Gaso. Asso. of Am., Kennedy Bldg., Tulsa, Okla., 1942.

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6. Nelson, W. L., Gas Enrichment (Flow Diagram), The Oil and Gas Journal, Sept. 12, 1940, p. 67.

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14. Nelson, W. L., Filling Propane Cylinders, The Oil and Gas Journal, Mar. 17, 1945, p. 121 and Mar. 31, 1945, p. 309.

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Applications

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2. Anon., Ford Installs Propane Mixing Station, Iron Age, Apr. 9, 1936.

3. Anon., Industrial Propane as a Glass Plant Fuel, The Glass Industry, Nov. 1937.

4. Friend, W. Z., Combustion Properties of Industrial Propane, Heat Treating and Forging, June, July, Aug. (1935).

5. Friend and Beckwith, Propane and Butane Have Specific Value in Production of Luminous Flames, Industrial Heating, Mar. and Apr. 1937.

6. Friend and Brennan, Combination Central Plant Can Furnish Complete (Gas, Electrical and Refrigeration) Utility Service at Low Cost, Gas, Mar. 1937.

7. Friend and Jamison, Industrial Propane Used for Many Different Purposes at Steel Foundry, Steel, Sept. 23, 1935.

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10. Jamison and Gerstell, Liquefied Gas for Ceramic Firing, Ceramic Industry, Dec. 1937.

11. Kirch and Carpenter, Producing 1,000 B t.u. Water Gas Using Butane, Gas Age, Aug. 17, 1939.

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21. Stein and Foley, Gas Makes Tractors Tough, American Machinist, Dec. 14, 1938.

Characterization Gravity

You have written much about evaluating crude oils but we find nothing about characterization gravity. Can you define it or direct us to a reference?—M. G. R.

Characterization gravity is a factor developed by Mithoff, MacPherson, and Sipos, "Characteristics of California Crude Oils," The Oil and Gas Journal, November 6, 1941, page 81, which is related to the octane number of cracked gasolines. It is the average A.P.I. gravity of the three fractions of a cracking plant stock which boil at 350°, 450°, and 550° F. at 25 mm. pressure. The relation of this factor to octane number is:

$$\text{Oct. No.} = 90.8 - 0.77\ (\text{A.P.I.})$$

A.P.I. DIGESTS—

Fuels for Jet and Propeller Gas Turbine Engines

A. J. NERAD, General Electric Co., Schenectady, N. Y.

of papers presented at the twelfth midyear meeting of the Division of Refining, American Petroleum Institute, St. Louis, June 2-3.

DOMESTIC air travel in passenger miles is now an appreciable percentage of the travel on the railroads in passenger miles—about 7 per cent and apparently growing. This does not offer the possibilities of increased fuel consumption which would come from an air-cargo growth. The fuel consumption per ton mile of air cargo is about 40 times that for cargo carried on the railroads, whereas on a passenger-mile basis it is comparable. This is based on a fuel consumption for the diesel train of 0.03 lb. of fuel per net ton mile (0.25 lb. of coal over-all for steam trains 1940), whereas the air cargo in recent planes appears to require close to 1 lb. of fuel per net ton mile. In aviation gas-turbine cargo planes this figure is somewhat conservative. Thus, should planes carry only 1 per cent as much cargo in ton miles as carried by the railroads, they would require 40 per cent as much fuel by weight as used in all railroad freight traffic (if all is diesel carried). It does not seem impossible that a heavy fuel consumption will come from the air in the not too distant future.

That this fuel should be used in the propeller and turbo-jet engines carries with it the assumption of their ascendency over the piston engine. It is safer to make this assumption for the not too distant future than the opposite owing to the outstanding characteristics and possibilities of these engines. Considering that the demand for this fuel will be large in the future, or playing safe that it might be, we can only point our choice of liquid hydrocarbon fuels to what is or will be highly available. The fuel considered most readily available has the volatility of gasoline, is high in aromatics, has a high sulfur tolerance, low viscosity, and a gum content limited only by the plugging of the fuel system.

In general the more volatile fuel allows for higher efficiencies at the very low pressures. There are components in fuels which have indicated effects on combustion efficiency other than from changes in volatility. It is likely that these are slower-burning components which require finer atomization. The thorough testing of a fuel would reveal this and it would have to be decided if combustion system or fuel need be improved.

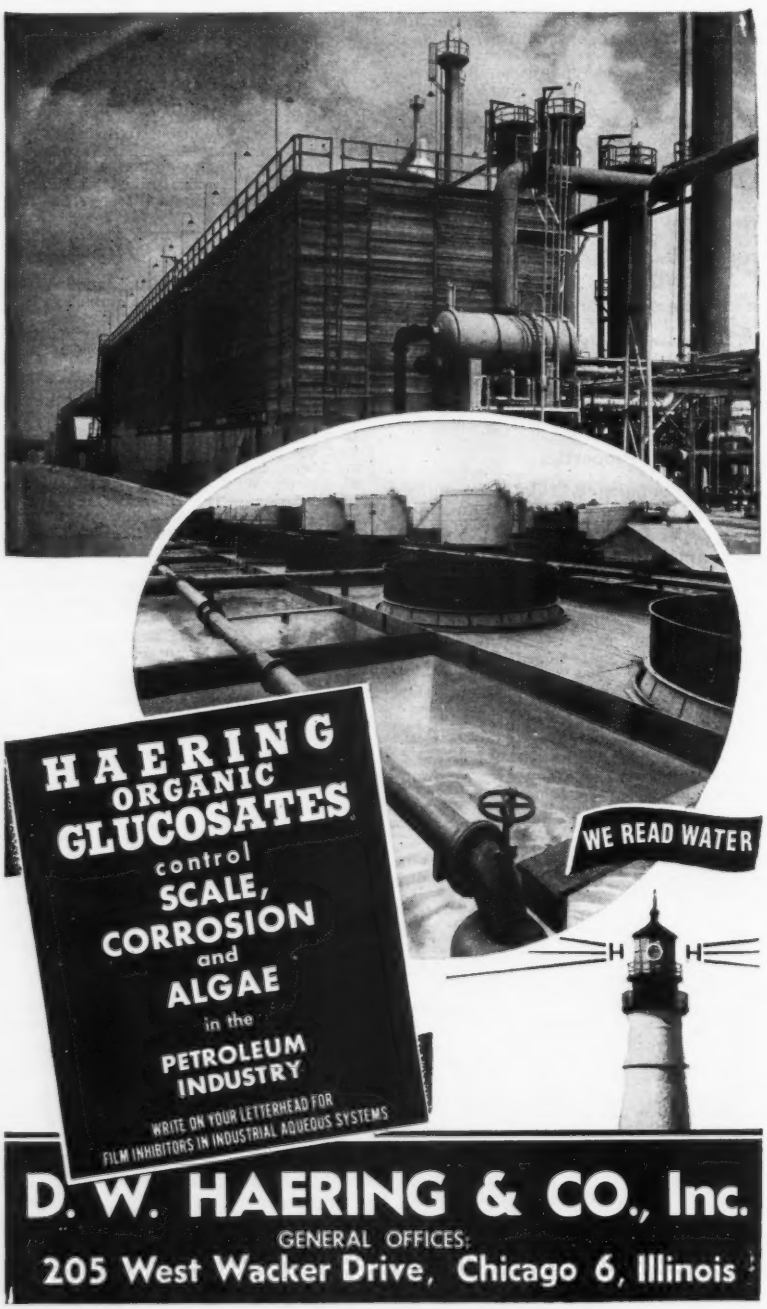
The aromatic component of a fuel is considered a ready source of carbon formation and smoke. Carbon deposits have a deleterious effect on flame tube life. The fuels with high volatility, however, tend to form less carbon. It has been shown, however, in combustor design that carbon formation may be eliminated through the use of an air film on the inside of the flame tube. The degree of freedom from carbon deposits depends entirely on the perfection of this film. It is a difficult problem to establish a perfect air film or film of low fuel/air ratio for among other things it requires very uniform air flow. However, this is the indicated method by which fuels of high aromatic content may be successfully burned in combustors.

A change of fuel to the volatile type of low viscosity undoubtedly introduces serious problems in the fuel system, particularly in the pumping. In this respect, there is work involved in converting from a fuel to the kerosine type. The use of kerosine as a fuel for aviation gas turbines has been mentioned in various publications as an inexpensive and safe fuel. The consideration of the relative safety of a fuel requires a thorough study under all conditions of manufacture, handling, storage, and use. There are conditions under which kerosine is unsafe when a high volatility fuel is safe, and vice versa.

As the choice of a fuel may be affected by the particular conditions encountered in an engine, a survey of these conditions for proposed new designs is desirable. One may guess, however, that the principal changes will involve higher pressures in the combustion chambers, higher temperatures to the turbine nozzles, and a greater range of pressures when higher altitudes are obtained. Such changes (except the last) do not greatly influence the choice of fuels. A volatile fuel is beneficial under such conditions.

In ordinary vortex nozzles of the Monarch type, a minimum fuel flow is required for proper atomization and this is above the necessary minimum to cope with engine conditions and fuel pump limitations. Besides this a fuel of low viscosity is readily atomized. The need for proper injection without too great or too little penetration must be recognized.

Solid, residual liquid, distilled liquid, and gaseous hydrocarbons have been burned in combustors under some conditions with apparently excellent results. Of course, the range of flow and pressures involved in a



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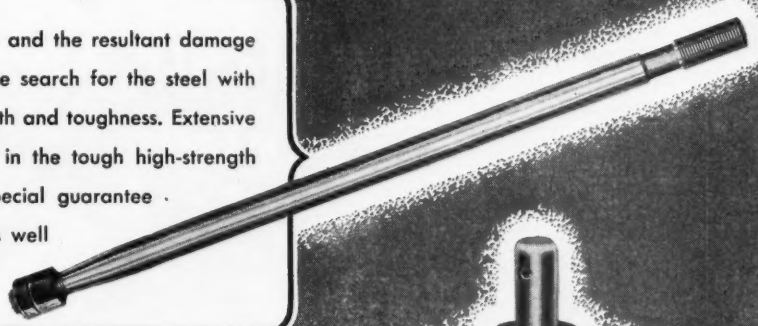
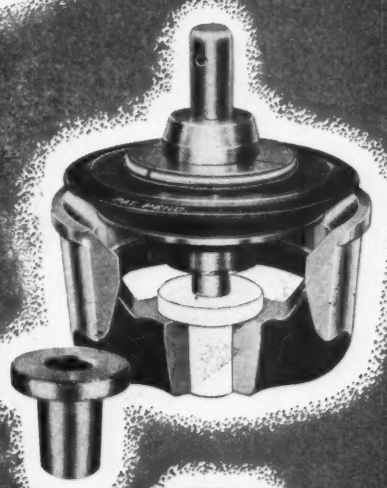


Steel requirements for maximum hardness differ from those for maximum toughness. The Mission Silver Top Valve design permits making the wear-taking bushing for maximum hardness and the valve seat for maximum toughness. This results in better valve service for Mission customers.



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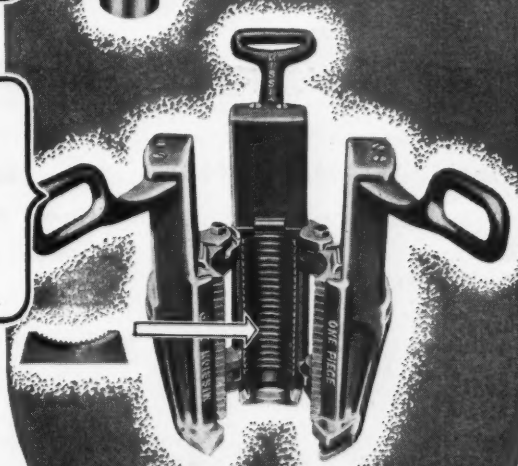

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jet engine has not been duplicated in all cases. The fuel injection has been modified to suit each fuel for these results. From success with such a wide variation in fuels comes the hope that a much smaller variation in properties of distilled liquid fuels will not prove impractical. It is no doubt possible that an ideal available fuel which best fits in with petroleum practice will economically, strategically and technically be fitted in with sound aviation gas turbine design and development.

The Synthesis and Properties Of Hydrocarbons of High Molecular Weight—IV

ROBERT W. SCHIESSLER, A. W. RYTINA, C. A. WEISEL, F. FISCHL, and R. L. McLAUGHLIN, Pennsylvania State College; C. H. HERR, E. I. DuPont de Nemours, Buffalo, and H. H. KUEHNER, Birk & Co., New Albany, Ind.

RESEARCH Project 42 of the American Petroleum Institute, placed at The Pennsylvania State College for the preparation and study of pure hydrocarbons of high molecular weight, is rapidly building a "bank" of hydrocarbons of various molecular types, and is carefully compiling their physical properties.

The work of the first 3 years was summarized in three papers of a series, which were presented at the twenty-second, twenty-third, and twenty-fourth annual meetings of the A.P.I. The correlations of physical properties with chemical structure of 66 pure hydrocarbons of high molecular weight were then reported. The present discussion deals with the continuation of the work, and 55 additional hydrocarbons of high molecular weight are now reported.

Project 42 is currently determining viscosity data on all the hydrocarbons up to 450° F., as well as the viscosities at high pressure and the compressibilities. In addition to the work on physical constants carried out at The Pennsylvania State College, samples of the pure hydrocarbons are loaned to special investigators in other fields for determination of additional physical data.

Considerable research was carried out during the past 2 years in improving the melting-point calorimetric method of determining purity. This method, developed by the project, has now been rather thoroughly investigated. It has numerous limitations which must be taken into consideration. However, it is now possible to determine the purity within ±0.2 per cent, the heat of fusion to within ±5 per cent, and the melting point to ±0.1° C. A number of the hydrocarbons prepared during the past 2 years have been shown to be better than 99 per cent pure.

Project 42 is studying in detail the various molecular types of hydrocarbons in the high-molecular-weight range. The new hydrocarbons made possible study of the effect of the para-methyl group, the effect of molecular weight and symmetry, and the effect of groups such as decalyl, anthracene, perhydroanthrancene, phenanthrene, and perhydrophenanthrene on physical properties.

The earlier work on the properties of mixtures of high-molecular-weight hydrocarbons was reported in the second and third papers of the series. During the period summarized by the present paper, a large amount of work on this important problem has been carried out, and further research is in progress. It is believed that the work now to be discussed is probably the most important contribution of this research project to date. The most interesting work of Project 42 on mixtures during the past 3 years concerns the correlation of the properties of pure hydrocarbons with the properties of hydrocarbon mixtures having the same average "type" composition and basic molecular symmetry.

The densities at 68, 100, and 210° F., as well as the refractive indices of certain mixtures have been calculated by means of the linear-additivity formula. In the case of density, properties were calculated at 3 temperatures for the 11 mixtures studied: hence, 33 separate calculations are compared with the experimentally determined densities. The results are similar to those found and reported in the third paper of this series. The aniline points of the nonaromatic mixtures have been calculated using the linear-additivity formula.

The furfural points of all 121 hydrocarbons reported by Project 42 have been determined. The method employed was the same as the A.S.T.M. method for determination of aniline point, substituting freshly distilled furfural for the aniline, and using only 2 ml. each of hydrocarbon and furfural. It is essential that the furfural be calibrated each day with a standard hydrocarbon sample. Small traces of water apparently have a large effect on the furfural-solution temperature.

Correlation of Accelerated and Laboratory Storage Measurements Of Gasoline Stability With Field Stability

E. L. WALTERS, leader, C.R.C.-M.F.D. Gasoline Additives Analysis Group.

THE Ordnance Department requested the C.R.C. gasoline additives group in December 1942 to recommend an accelerated oxidation test and suitable test limits so that gasoline would be fit for general use (sensibly free from gum) anywhere after 6 months' storage in 5-gal. "blitz" cans under the most severe temperature conditions likely to be encountered in any theater of operation. Based on available information, an assumption was made that such fuels should contain 7 mg. or less

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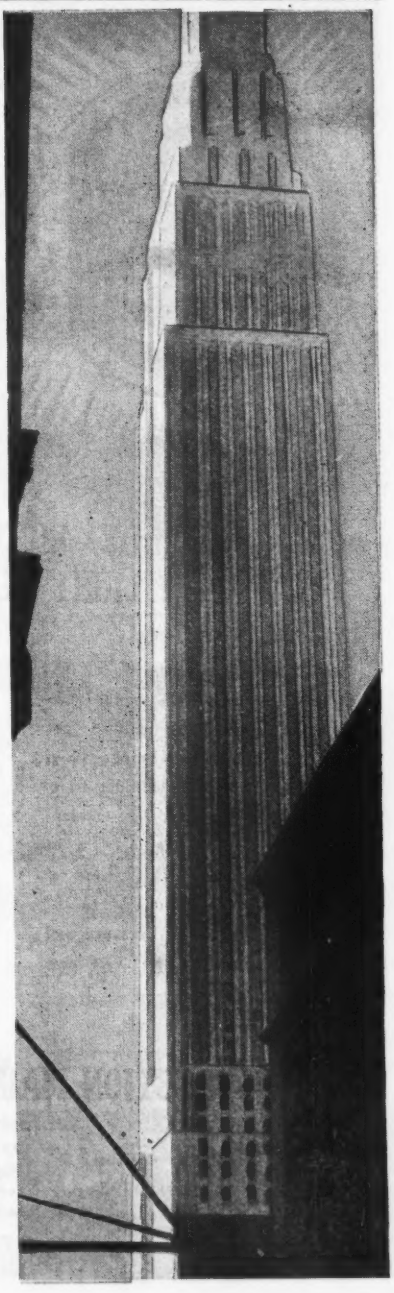

A.S.T.M. gum per 100 ml. at the time of use.

Tests started in 1943 were intended primarily to provide information concerning the validity of the induction period and other accelerated test procedures for predicting gasoline stability. These tests also provided information concerning the validity of laboratory (vs. field) storage tests and the effect of antioxidants on stability. However, while specifications in effect apparently were providing satisfactory field performance, the 1943 tests were not all conclusive. The induction-period tests were found to provide reasonably correct, but not altogether precise, correlations with actual storage. Certain aging gum-time procedures appeared to provide better correlation. Thus, it was considered desirable to initiate a second series of tests in 1944 to study these points in greater detail. Minor points originating during and subsequent to both series of tests necessitated the conductance of a limited number of tests in 1945 as well.

Of the nine accelerated test methods studied, the A.S.T.M. induction period and the two 7-mg. gum times at 100° F. appeared worthy of most serious consideration from the point of routine adaptability and reproducibility. For ratings based on all fuels, the gum time procedure at 100° C. and the 100 psi. oxygen appeared to give the more reliable measure of storage stability.

Tests Extended

At the inception of the 1944 storage tests, 80-octane all-purpose gasoline was required to be stable (contain no more than 7 mg. A.S.T.M. gum) after 6 months' storage under severe conditions, estimated to approach 110° F. storage in the presence of air. Like the 1943 tests, these tests were intended to be of 6 months' duration, but at the request of Ordnance, were extended for 18 months.

Slight variations were made in the scope and conduct of the 1944 tests compared to 1943. Desert tests were made only in plain steel blitz cans and drums. Owing to the length of test, all cans were sampled more than once, providing some indication of the effect of venting. Laboratory storage tests in glass were carried out simultaneously under air at 110° F. and 90° F. sealed and vented, respectively.

On a percentage basis, the correctness of predictions appeared better in 1944 than 1943, owing possibly to slightly lower storage temperatures. Tests at 110° F. were intermediate in severity between desert can and drum storage, with correlations being reasonably good, particularly for stable fuels, i.e., those having low gum content after storage. However, the more unstable fuels were degraded more severly in the laboratory storage than in desert storage; possibly because of greater accessibility to air. This indicated the desirability of excluding air or tight sealing in actual storage insofar as it is possible to do so. Of the 18 fuels rated, 16 were given similar ratings by the laboratory and over-all methods, while 2 yere rated less severely by the laboratory test. Laboratory tests were also found equally reliable for measuring the stability of aviation fuels.

Limited Study on Antioxidants

Antioxidants were studied only to a minor extent in the 1944 tests. Statistically the so-called preferred antioxidants satisfactorily stabilized 2-103B fuels under both accelerated and storage conditions. Studies of the rate of antioxidant disappearance during storage proved somewhat inconclusive.

Metal deactivators indicated promising stabilizing action in the 1943 tests, when used in conjunction with antioxidants. Additional tests in 1944 indicated that metal deactivators generally tended to improve the storage stability of unstable fuels, more so than indicated by accelerated tests, but were without significant action in stable fuels. In general, the deactivators appeared effective only if used in sufficient amount to counteract the deleterious action of copper; further amounts of deactivation gave no additional benefit. No conclusion could be drawn with regard to deactivator type, since the three types of deactivators were tested in a stable fuel.

Limited studies of octane number measurements during storage indicated octane number losses for 6 months' storage to be quite small, averaging less than one unit. The fuels tested peroxidized little, although some did contain in excess of 10 mg. A.S.T.M. gum 100 ml. at the end of storage. Haze formation, evident only in the more unstable fuels, did not appear related to change in octane number or TEL content during storage, both of these being small.

The Component Parts of Gasolines

CECIL E. BOORD, Director, American Petroleum Institute Research Project No. 45.

A P. I. Research Project 45, "The Synthesis, Purification and Properties of Hydrocarbons of Low Molecular Weight," is now nearing the end of its ninth year. For 6 years, this project operated as an independent project known as A.P.I. Hydrocarbon Research Project, (A.P.I.H.R.P.). The original project included the synthesis, purification, superpurification, physical-constants measurement, and engine testing of pure hydrocarbons. With the advent of World War II, emphasis was laid upon products suitable for use as aircraft fuels.

The war effort also placed a new emphasis upon the value of dependable physical constants and the necessity for high purity analytical standards. With this shift in emphasis, and the attendant expansion, the superpurification was transferred to

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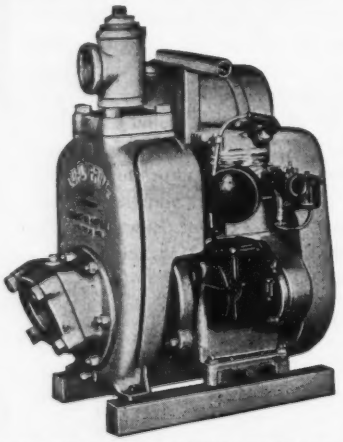

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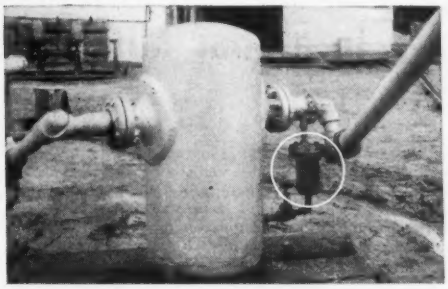

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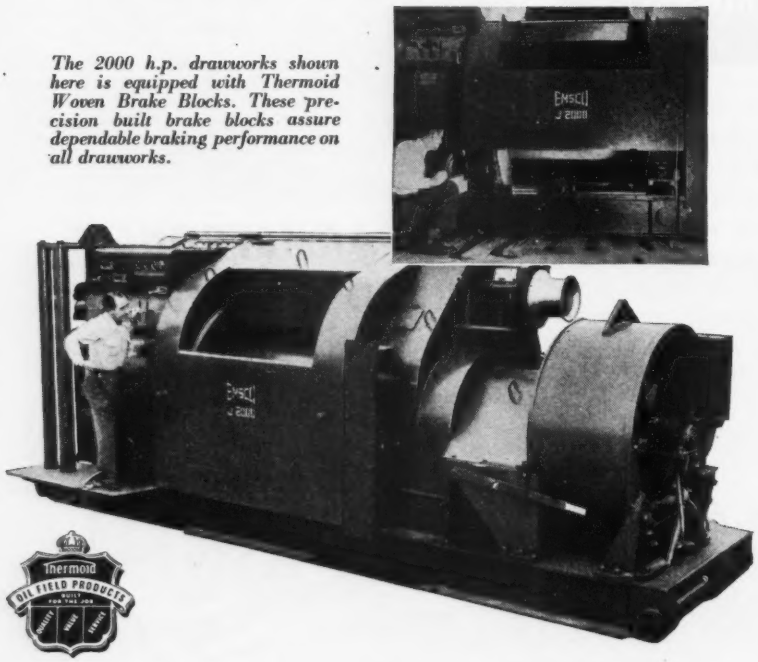

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A.P.I.R.P.-6 at the National Bureau of Standards.

Older methods of synthesis have been adapted and new methods have been invented for the preparation of all types of hydrocarbons. It seems possible to produce synthetically any or all of the individual hydrocarbons known to be in gasolines. Engine characteristics of individual motor fuels have been carefully measured and compiled and the data distributed to the contributors of the A.P.I. research program.

The project during the 9-year period of its operation has covered more than twice the number of products on its initial list. The work has required more than twice the time originally allocated for the purpose. A recent survey indicates a desire for more data on high-purity products, and more high-purity standard samples. The call is for more hydrocarbons of every type and the project plans to supply them.

Engine Knock and Molecular Structure of Hydrocarbons

WHEELER G. LOVELL, Research Laboratories Division, General Motors Corp.

THE reason for the interest in the knock behavior of fuels in engines is that knock stands as a fundamental limitation to the efficiency and power output of the engine-fuel combination.

The work done under A.P.I. Project 45 on the measurement of the knock behavior of the pure hydrocarbons prepared at Ohio State University and tested at the General Motors Corp. and Ethyl Corp. laboratories has provided the petroleum and automobile industries with an extensive fundamental background of how the various types of fuel hydrocarbons behave in engines. Up to now, there are engine data on about 225 pure hydrocarbons, many of which have been measured under as many as 29 different operating conditions. This represents the greatest consistent body of knock data on hydrocarbons in existence.

The enormous amount of data obtained in this endeavor has made it possible to correlate the molecular structure of hydrocarbons with knock ratings, sensitivity, and lead susceptibility.

The practical economic gains to be had with fuels of greater freedom from knock may be very great. Such data are of interest to engine manufacturers who must make engines to suit the available fuels. For one thing, it is possible from such data to get an idea of what can be done with engines provided the fuel is such that there is no limitation of knock. Higher outputs and very high thermal efficiencies are possible. It is possible to make an engine of almost conventional design, with a compression ratio above 12 to 1, which is smooth, free from roughness, and low in friction. Moreover, when mounted in an automobile, this engine gives performance comparable with that of current production cars, with an increase in fuel economy of one-third. The fuel requirement of such a car is about 100 octane by the research procedure. The gains to be had by the right molecular structure of fuel in an engine designed to take advantage of the fuel are thus very great.

The Importance of Flexible Pipe Supports

E. W. STOTHART, manager, Pipe Suspension Department, Grinnell Co., Inc.

IT has been recognized by the engineering profession that total pipe stress is the addition of bending, torsional shear, longitudinal and circumferential pressure stresses. Yet, unless careful study is given to the design and selection of spring supports which will maintain a balanced pipe suspension system, the transfer of weight from one hanger to another will be the cause of an additional type of stress, the

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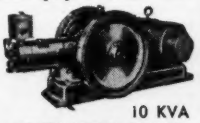

10 KVA DIESELECTRIC PLANT

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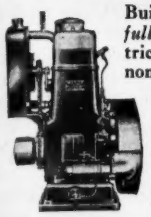

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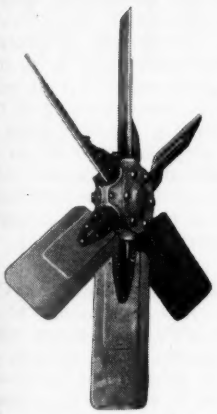

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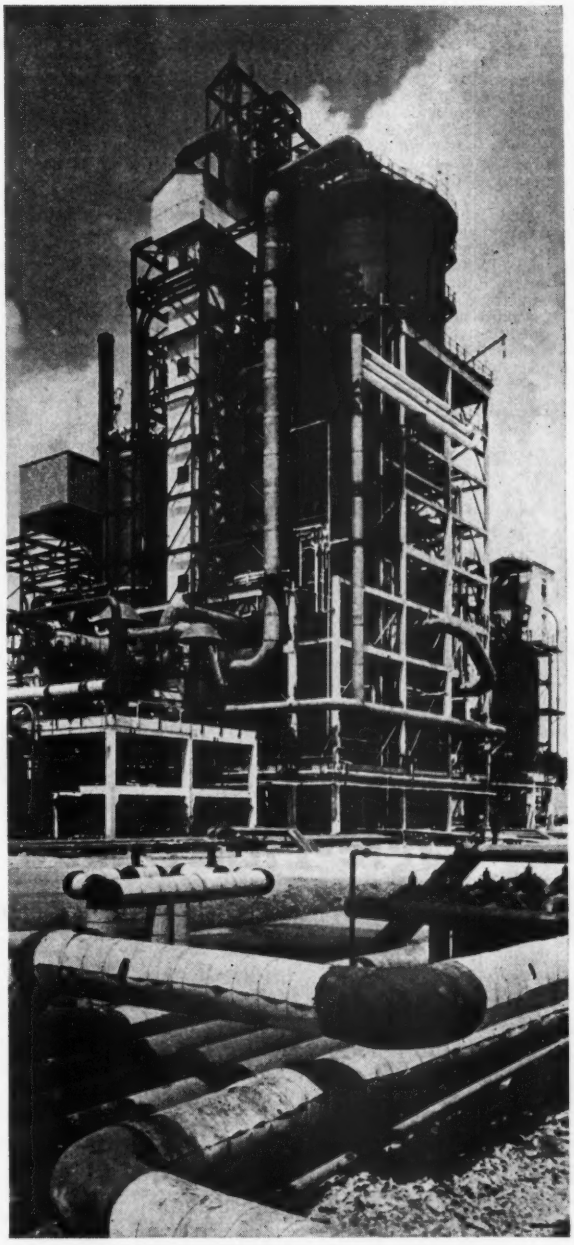

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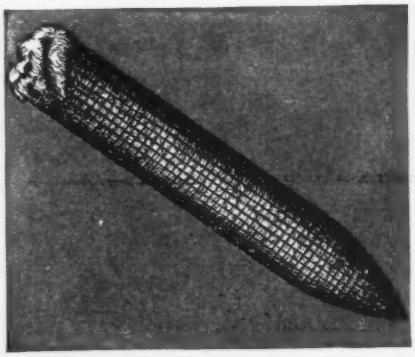
weight transfer stress, that warrants consideration insofar as the safety factor of the entire system is concerned.

The trend towards higher and higher temperatures has produced developments in flanged joints, valve design, expansion bends to provide a more flexible system, welding procedure, and metallurgy that make possible the operation of power and processing plants and refineries at temperatures up to 1,100° F. or more. When thermal expansion takes place in a piping system, the resultant forces induced are tremendous. The practice of using helical coil springs to allow this thermal movement to take place is quite general, but the care that goes into the design or selection of flexible supports is looked upon by many as a casual matter. In fact, many specifications covering the support of important high temperature piping will simply say, "spring hangers shall be provided." Analysis of a specific problem on the subject, however, shows the magnitude of this matter.

There are a large number of details that are often confused in a piping system. Sometimes these details may be perfectly clear to the designing engineer, nevertheless may be poorly specified and misinterpreted by the erector or operating engineer. One of the most common difficulties concerns the setting of the hangers in the hot or cold position. Another very common mistake is the result of drawings that specify "cold pull" or "cold spring."

Although a good erector can always deflect a spring hanger just the right amount to produce a balanced system in the operating or nonoperating position, since pipe stress is such a complicated mathematical problem, it should not be the erector's responsibility to make a decision in this matter. It is the engineering design of the hangers that will assure a safe piping system.



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Brookhaven Field Development Problems

(Continued from page 97)

was not completed until August 1945. Even after that, development was carried on slowly with only two or three rigs running until late last summer and early autumn. Then, with only a comparatively short time remaining to evaluate numerous small tracts on which leases, originally taken in 1937, were due to expire in May and June of this year, the amount of drilling accelerated rapidly. Peak development was reached in April and early May when 42 drilling rigs were operating. Since then, with many of the lease obligations having been fulfilled, development has begun to taper off to necessary offset requirements and routine proving up of remaining undrilled proved locations.

Earlier Development Discouraged

Earlier development was discouraged as a result of the discovery well, drilled by California Co., being completed only as a small pumper. This well (1 G. T. Smith, NW NW 4-7n-7e), still one of the structurally highest wells in field, happened, however, to be located at a place where sands tended to shale out into the dry area at the crest of the structure, and found poor sand conditions which discredited the discovery and importance of the field. As an exploratory test it was drilled to a total depth of 11,625 ft. in the Lower Cretaceous and then plugged back to its present depth where the producing section was topped at 10,138 ft. Immediately following its completion, California Co. drilled two additional tests, one (1 Hettie Smith) about a half mile east of the discovery well, and the other (1 Granbury Smith) about a mile north. Both, since found to be within the bald area, were dry holes and further discredited the field with the result that no further development was undertaken until 1945.

Originally, practically all leases in the field were held by California Co., Sun Oil Co., and Stanolind Oil & Gas Co. Since 1945, the first two companies, the largest lease holders in the field, have farmed out numerous scattered tracts to various other companies and operators, principally Roeser & Pendleton, who drilled the second well for the field. The latter well, located about 2 miles south of the discovery well, proved a good producer, and has led to continuous development since then.

So far as actual drilling is concerned, no particular difficulties or hazards have been experienced. The 10,500-ft. well depths have dictated the use of large and heavy drilling rigs and equipment. Due to the scar-

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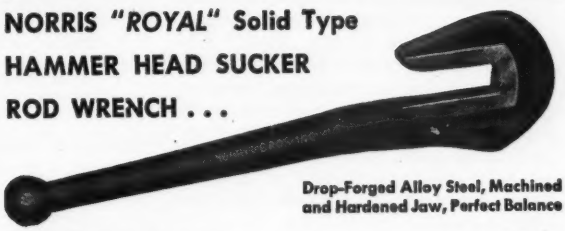

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city of gas for fuel, all but five of the rigs have been mechanically powered, using diesel or butane-burning engines. Steam rigs have been using practically all the gas produced and their boilers are equipped with combination burners so that they can fire with oil when there is not sufficient gas. Lately, however, Sun has laid a gas line into the field from United Gas Co. trunk line, 5 miles distant, and is purchasing gas for engine fuel.

Wells require from 45 days to 2 months and cost around $125,000. Formations are fairly hard, taking from 30 to 40 rock bits. The drilling program normally calls for from 1,000 to 1,200 ft. of 10¾-in. surface casing, cemented to the top in 15½-in. hole, with some operators using 7-in. and others 5½-in. casing in 9⅞-in. or 8¾-in. hole for the oil string. Because of low pressures, swabbing is required to place wells on production.

Drilling contractors in the field and the number of rigs operated by each have been: Cook Drilling Co., 1; Crescent Drilling Co., 2; Danciger Oil & Refining Co., 5; Dixie Drilling Co., 1; Hawkins-Graham Drilling Co., 1; Helmrich & Payne, 2; Hewgley Drilling Co., 1; Loffland Bros., 6; Morris-Hamilton Drilling Co., 1; Noble Drilling Co., 1; Parker Drilling Co., 8; Penrod Drilling Co., 2; Rex Drilling Co., 1; Roeser & Pendleton, 7; Rowan Drilling Co., 1; Spartan Drilling Co., 1; Sharp Drilling Co., 1.

Delhi—Biggest Stratigraphic Trap

(Continued from page 110)

approaches the magnitude of Delhi-Big Creek. The search for similar stratigraphic traps continues, and the possibility of finding them is considered good in the tristate area. Since such prospects cannot be specifically located by the conventional surface methods employed to reveal the common types of structure, exploration by drilling must follow additional intensive subsurface studies of the region, and such a program will require a long period of time.

Drilling Costs Reduced

In general, drilling to the shallow producing sands at Delhi has entailed no particular problems. As field development progressed, facilities improved, practices became more standardized and less coring was done. As a result, drilling time and drilling rates were reduced. Actual drilling costs, excluding cost of casing, surface equipment, and roads declined about 33 per cent in 1946. Table 1 details such costs for 1945 and 1946, based on the average of a substantial fraction of selected Delhi and West Delhi wells. Road building in the low, marshy field became a major expense. Installation of costly board roads to drilling locations and the subsequent construction of permanent graded roads lacing the field cost operators, on the average, $10,000 per well.

As shown in Table 2 listing characteristics of the four principal reservoirs, the Holt-Bryant shows an active water drive which has largely maintained reservoir pressure and controlled gas-oil ratios during the past 2½ years. Wells producing from the other sands show in general, rapidly declining bottom-hole pressures and mounting gas-oil ratios and will probably require artificial lifting within a relatively short period. A total of 15 such wells were on the pump at the first of this year, and it is estimated that the remainder of the hundred-odd wells not producing from the Holt-Bryant zone will require pumping or other artificial lifting equipment within the next 2 years. Half of them may well be on the pump before 1948.

Engineers of the operating companies in the fields have formed a field engineering committee which is closely following the production performance of the reservoirs at Delhi, West Delhi, Big Creek, and South Big Creek, a small producing area south of the main field group.

Recoverable reserves from the multiple horizons at Delhi and Big Creek are difficult to evaluate. A conservative estimate shows a recovery of 200,000,000 bbl. of oil from the field group.

Two pipe lines serve the field group. Sun Oil Co.'s two 6-in. loops move Delhi and West Delhi production 23 miles eastward to barge terminals on the Mississippi River near Vicksburg. Interstate Oil Pipe Line Co. serves the Big Creek field with a 6-in. extension laid northward from the company's system serving Lake St. John and Holly Ridge fields in Tensas and Concordia parishes.

Although 32 different operators own production in the field group, the field discoverers, Sun and Murphy, hold about half the wells which account for over half of the total current production. Of the remaining operators, seven are major oil companies, producing about 21 per cent of total production. Cumulative production from all wells in the area reached 9,965,582 bbl. by March 31, 1947.

TABLE 1—BREAKDOWN OF AVERAGE DRILLING COSTS—DELHI FIELD

	Avg. well 1945	Avg. well 1946
Total depth, ft.	3,400	3,400
Avg. drlg. time, days[1]	24	14
Costs—		
Drilling	$11,550[2]	$8,250[3]
Day work[4]	2,000	500
Mud	1,000	500
Coring[5]	300	.....
Cement surface casing[6]	320	320
Cement long string	520[7]	430[8]
Electric log	315	315
One d.-s.t.	210	210
Completion[9]	1,300	1,300
Perforation	400	400
Total cost	$17,915	$12,225

1. Includes time from moving in to completion, waiting on cement 48 hours on both surface and long strings.
2. 3,300 ft. at $3.50 per ft.
3. 3,300 ft. at $2.50 per ft.
4. Day-work rates: $450 when drill pipe in use; $400 when machinery in use, drill pipe idle; $250 when all machinery idle.
5. Generally 20 free cores, $10 per core in excess of 20.
6. 215 sacks cement.
7. 300 sacks cement.
8. 200 sacks cement.
9. Includes running, cementing, and testing oil string, drilling plug, perforating, electrical logging, washing in and swabbing 8 hours. Service thereafter at appropriate day rates.

Above figures do not include cost of pipe of christmas tree, which costs vary with operators. Normal Delhi program:

500 ft. 9⅝-in. H-40 36# SS casing
3300 ft. 5½-in. H-40 14# SS casing
3200 ft. 2-in. EVE 4.7# tubing
4000-psi. test tree, avg. cost $1,200

Operator pays cost of mud, contractor pays for fuel up to $1,500 and drilling bits. Average bit program:

1—12¼-in. rock or fishtail bit per 3 wells
2-3—8¾-in. rock bits per well
1-3—7⅞-in. core bits per well

Operator pays for core heads.

TABLE 2—CHARACTERISTICS OF THE FOUR PRINCIPAL CLASSIFIED RESERVOIRS AT DELHI-BIG CREEK

	Delhi-West Delhi		Big Creek	
	Holt-Bryant zone	May sand	Price sand	Howard sand
Number of wells	198	16	28	9
Acreage proven	3,000	650	1,150	400
Avg. thickness, ft.	30	6	20	7
Max. effective thickness, ft.	120	10	40	10
Avg. porosity, per cent	28-30	30	32-35	.....
Permeability range, md.	0-5,000	0-5,000	.....	.....
Connate water, per cent (est.)	30-60	30-60	.....	.....
Gas-oil contact	—3,135	none	none	—2,799
Water level	—3,286	(?)	2,901-11	none
Gravity, oil, °A.P.I.	41.0	39.5	41.0	42.0
Gas-oil ratio, current, cu. ft./bbl.	417	1,030	675	820
B.h.p., original	1,530 @ —3,135	1,556 @ —3,300	1,365 @ —2,800	1,416 @ —2,800
B.h.p., current (est.)	1,460	1,050	1,275	1,000
Oil prod. to 4/1/47, bbl.	7,487,403	503,794	661,717	191,822
Gas prod. to 4/1/47, M.c.f.	3,151,673	337,384	336,124	128,757
Oil prod., bbl./lb. press drop (est.)	107,000	1,000	7,350	460
G.p.m. gas	2.5	1.5	.....	.....
Type reservoir drive	Water	Solution gas	Solution gas	Solution gas
Geologic age	Tuscaloosa, Paluxy and Upper Glen Rose	Tuscaloosa	Tuscaloosa	Tuscaloosa

Anchor-Bolt Design for Tall Refinery Vessels

by Simon W. Lewaren

IN determining the size of anchor bolts to be used for anchoring tall vessels to their foundation pier, two values must first be established: (1) the bolt circle, and (2) the number of bolts to be used. The first is usually set by putting the bolt circle 2½-3½ in. outside of the vessel diameter, thereby permitting anchor nuts to be screwed down with sufficient clearance. The number of anchor bolts equally spaced on the bolt circle is determined by the size of the vessel, magnitude of stress, and orientation. The point to remember is that too few may cause undue distributed stress on the vessel base, and too many may present an unnecessary problem of getting the vessel over an excessive number of anchor bolts.

Since the stress on the bolts is tension caused by uplift due to wind, earthquake, or other live loads, the analysis used is similar to that of an eccentrically loaded pile or rivet group. It is further assumed that the moment at the base, caused by live load, will pass through the center of gravity of the bolt group. The only statical force resisting this moment due to the live load is the dead weight of the vessel itself. If the vessel were placed directly on the bolts instead of on a foundation, it would be safe to assume that each bolt would receive an equal compressive stress since they are equally spaced. Hence we can set up the formula:

$$S_{c,\,p} = \frac{P}{A} \pm \frac{M}{I/c}$$

which may be plotted as shown in Fig. 1. From this analysis, the extreme bolt normal to the axis, about which the section modulus or I is taken, is subjected to the greatest stress of any of the bolts in the group.

At this point, a brief review of mechanics will perhaps enlighten any further analysis of this type. From Fig. 2 it can be seen that the moment of inertia for each bolt in the circle is computed from the formula $I = Ar.^2$ In this case $A = 1$ (unity). Then, by summation, the I_T of the entire group is derived. Dividing this I_T by the distance of the extreme bolt as described previously, gives the section modulus of the bolt group. Observe that moments were taken about an axis whereby no two bolts coincided. This produces a least section modulus, thereby giving a maximum possible computed stress which is apparent from the term

$$\frac{M}{I/c}$$

Its justification lies in the fact that a wind load can occur in any direction.

Table 1 gives values for moments of inertia and section modulii of 4, 6, and 8-bolt groups for a bolt circle of 1-ft. diameter. By direct proportion, section modulii of any bolt circle having the same number of bolts listed can be derived.

Example.—A receiver 2 ft. 9 in. in diameter and 40 ft. high weighs 12,000 lb. including manholes, flanges, nozzles, etc., when ready to be placed on its foundation. Its bolt circle is 3 ft. 3 in. in diameter. The bolt circle will contain six bolts equally spaced.

Wind moment = 25 × 2.75 × 40.0 × 20.0 = 55,000 ft.-lb.

Section modulus of bolt circle = 2.20 × 3.25 = 7.15 cu. ft.

$$\frac{P}{A} \pm \frac{M}{I/c} = \frac{12{,}000}{6} \pm \frac{55{,}000}{7.15}$$

$$= 2{,}000 \pm 7{,}680$$

Stress on extreme bolt = 2,000 — 7,680 = —5,680 lb. uplift.

Hence, using 20,000 psi. for tension with the critical area being at the root of the thread on the bolt:

$$A = \frac{5{,}680}{20{,}000} = 0.284 \text{ sq. in.}$$

A ⅝ A.S.A. coarse-thread series bolt has an area of 0.202 sq. in. at the root diameter of the thread and a ¾-10 thread bolt has an area of 0.302 sq. in. at the root diameter.

Since some structural codes specify unit stress for live loads to be increased one and one-third over the allowable, some designers do not include ⅛ in. extra for corrosion allowance as long as the computed area is less than the actual area chosen. Hence it is a matter of individual practice to accept a ¾-in. bolt or a ⅞-in. bolt, depending on values established for initial tension allowed for wrenching the anchor bolt when the vessel is erected originally.

TABLE 1

(For bolt circle of 1-ft. diameter)

No. of bolts ..	4	6	8
Moment of inertia	1.2448 ft.⁴	2.1137 ft.⁴	2.8530 ft.⁴
Sect. modulus	1.44 ft.³	2.20 ft.³	2.96 ft.³

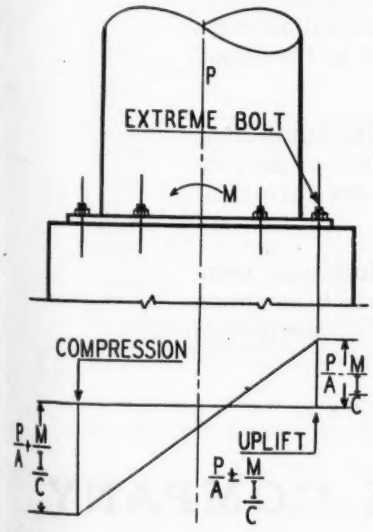

Fig. 2

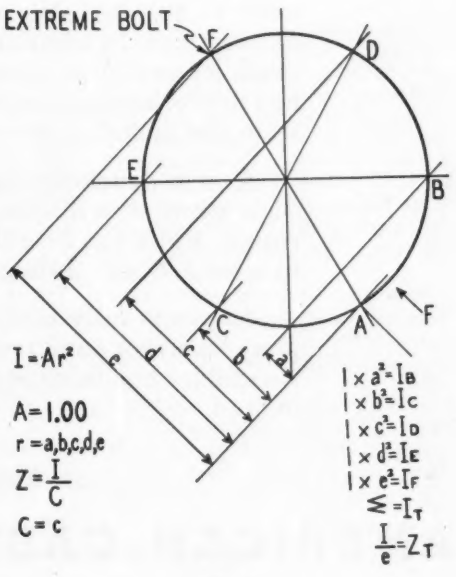

Fig. 1

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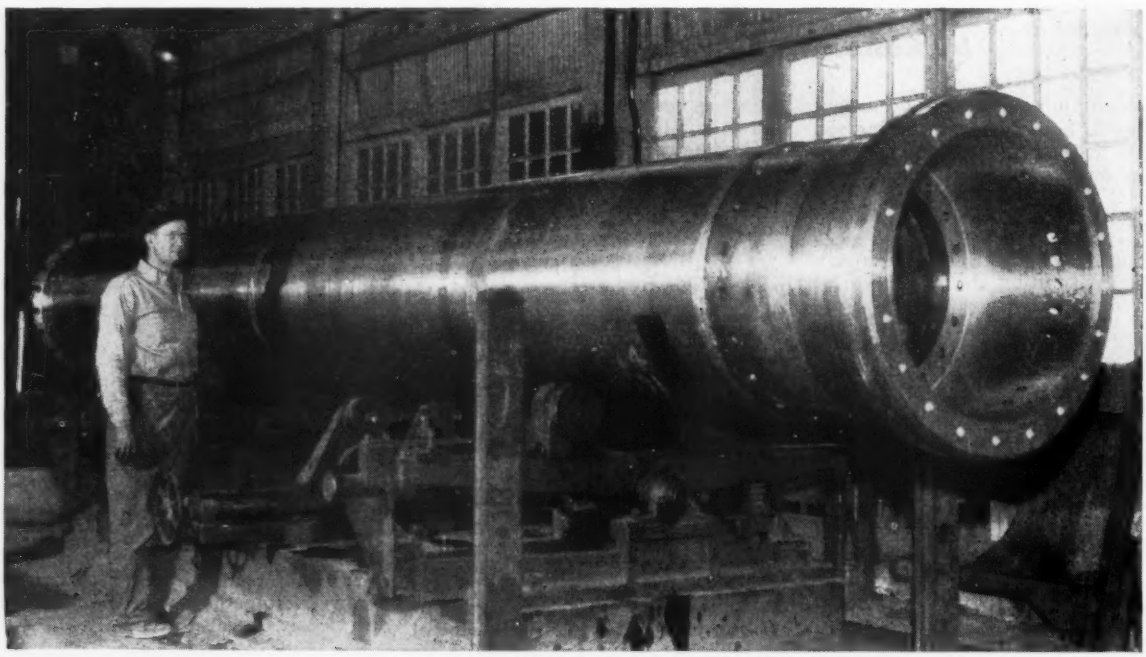

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MODERN Rotary DRILLING

Electrical Power Transmission

HERE will be given the basic principles of the electrical method of transmitting power in a rotary rig, particularly as concerned with the hoisting system of the rig. This is the third method used in transmitting energy from the prime mover to the driven elements of the power rig. The other two, the mechanical and the hydraulic transmissions of power, were discussed in the preceding installments. Only direct-current rigs will be here considered.

Electric transmission of power in a rotary rig consists essentially of an electric generator, coupled to a prime mover; an electric motor, and suitable controls. From the point of view of the hoisting system of the rig this arrangement offers three main advantages: (1) maximum torque at zero speed at the driven end of the transmission train, without affecting the speed of the driving element (prime mover); (2) ability to fix a maximum load on the prime mover, thus protecting same from overload, and (3) torque conversion over a smooth curve during the hoisting. Certain additional advantages are attained by the recently developed electro-hydraulic engine governor, to be described in the following installment. All these characteristics give an electric rig the smoothness and flexibility of a steam rig.

Around 60 direct-current rigs have been sold in the last 15 years, although some of them since have been combined into larger units. High initial investment, together with need for specialized maintenance, limit the field of competition of electrical rigs primarily to deep drilling. However, with the present trend toward increased depth of wells to be drilled, this field has been considerably broadened.

Requirements imposed by types of loadings occurring in a rotary rig are met by use of electrical machines with certain specific characteristics. Generator design is such that the current-voltage curve drops to zero at a predetermined value of the amperage. The generator output rises to a maximum, which is limited to the capacity of the prime mover; then it declines as the amperage continues to increase (Fig. 26).

The electric speed is controlled by the generator voltage and the torque is directly proportional to the amperage drawn from the generator. Motor torque is inversely proportional to its speed (Fig 27).

Translated into mechanical performance, these characteristics explain the above-outlined three advantages of the electrical transmission of power in a rotary rig. As the load on the motor increases, requiring increased torque, and placing increased amperage requirement on the generator, the demand on the prime mover does not exceed a certain maximum. This maximum is set to correspond to the capacity of the prime mover, which thus is protected automatically from the overload. Even with motor completely stalled the speed of the prime mover is not affected since only very small percentage of the engine's ability is utilized. The stalling torque of the motor is limited to a safe value by the maximum amperage of the generator. The mechanical elements of the rig therefore are protected from torques which could exceed their capacity. This is particularly important in case of the pump and rotary-table drives.

As far as hoisting is concerned maximum torque with motor stalled means smooth pickup of the loads. With generator voltage controlling the speed of the motor, regulation of this voltage permits wide selection of speeds and makes possible uniform speed increase within each speed of the draw works (Fig. 28).

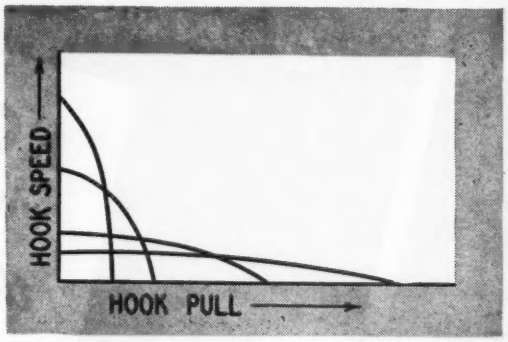
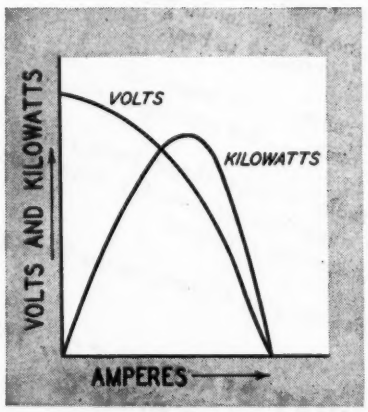


Fig. 28—Typical hook speed and pull relations for different draw-works combinations of an electric rig



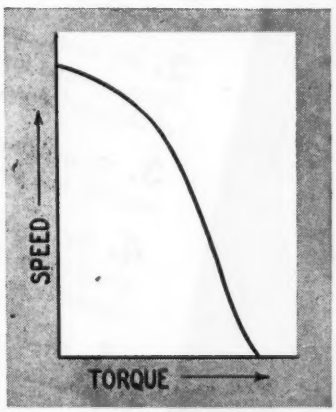


Fig. 26—(Left) Characteristics of direct current generator used in an electric rig.
Fig. 27—(Right) Speed-torque characteristics of a direct-current motor used with an electric rig

No. 24 in a series by Joseph Zaba, petroleum engineer, Houston

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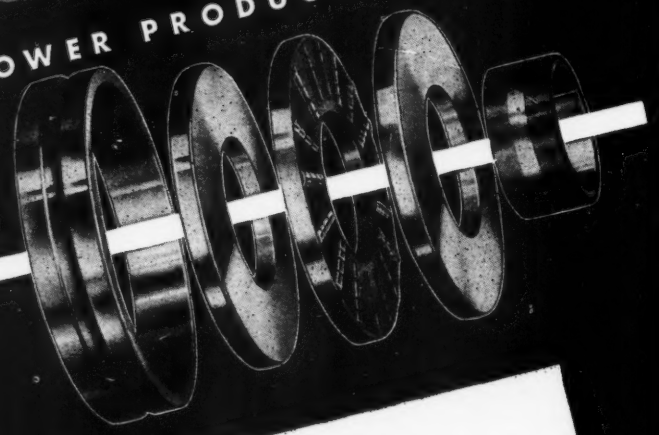

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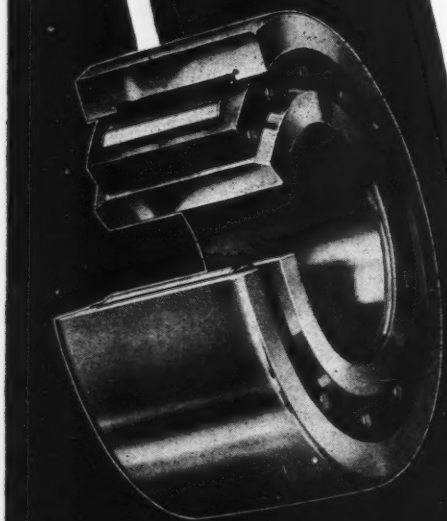

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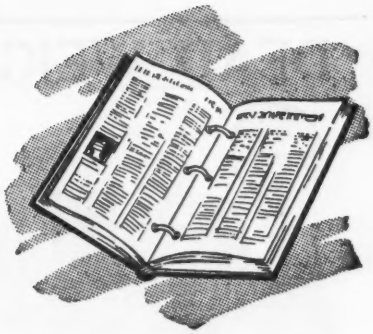
The Refiner's Notebook

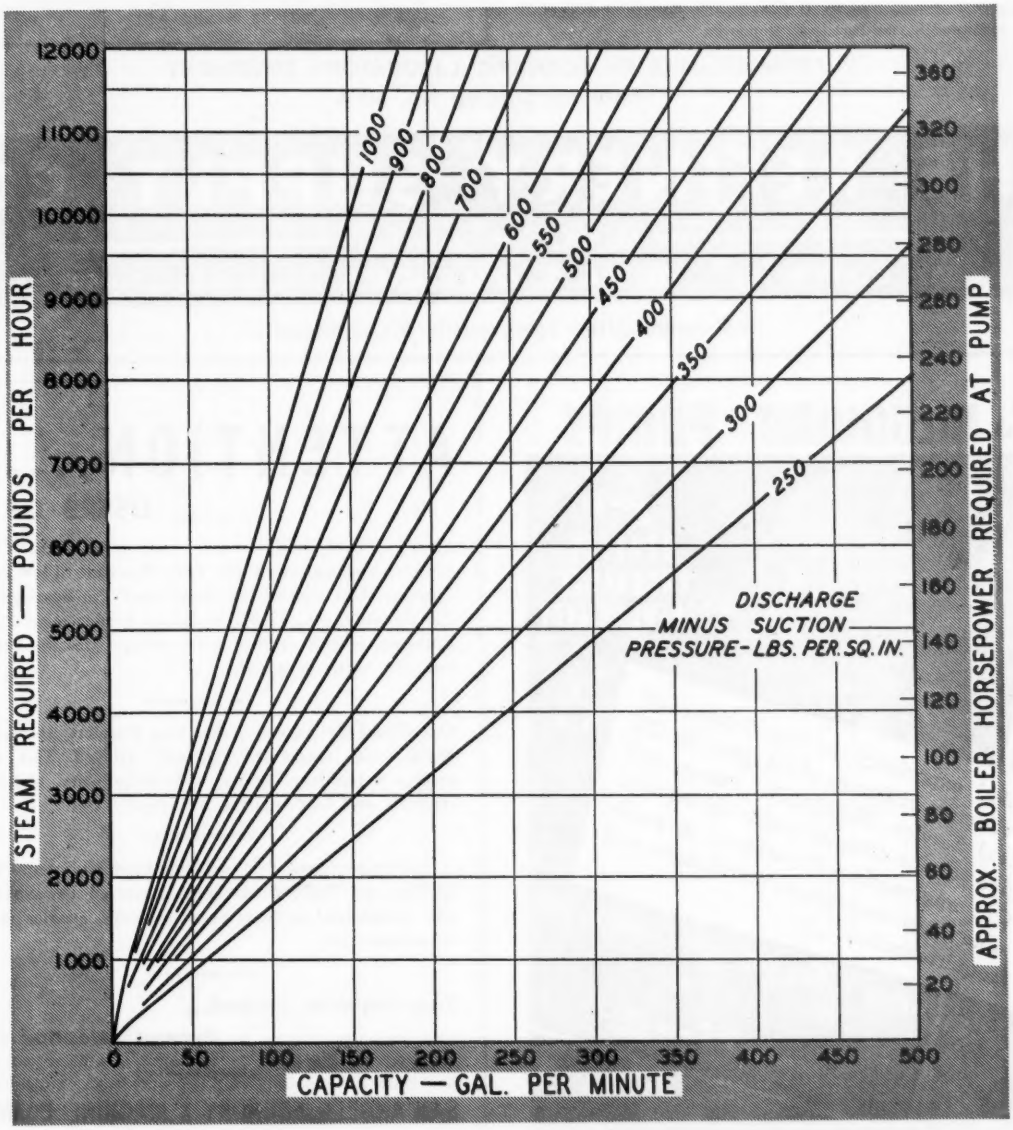
A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL



Steam Consumption—Part 2

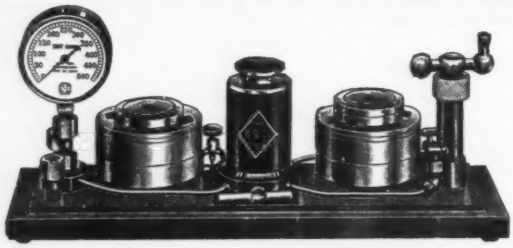
Power Pumps

Kind of pump—	Factor	Kind of steam—	Factor	Steam pressure—	Factor
Power duplex	1.00	40° F. superheat	0.96	100 psig. saturated	0.99
Power plunger	1.02	100° F. superheat	0.90	125 psig. saturated	1.00
Pressure over 1,000 psi.	1.14	99 per cent quality	1.04	200 psig. saturated	1.02
Thick liquids	1.1-1.2	98 per cent quality	1.10	300 psig. saturated	1.04



No. 148 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

DEAD WEIGHT TESTING INSTRUMENTS



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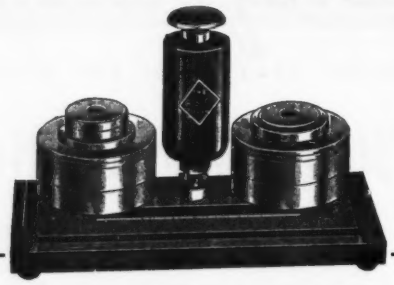

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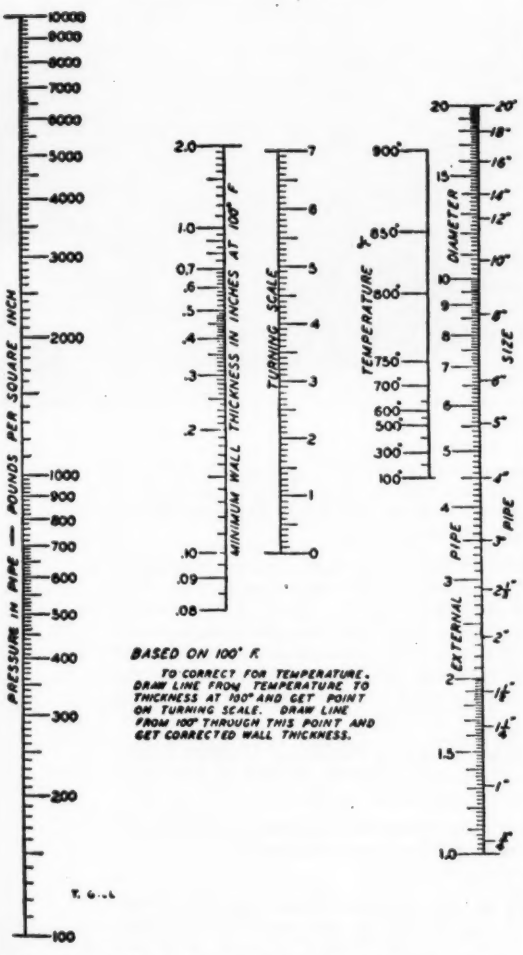
ENGINEERING fundamentals

This is the fourth of a series of useful graphs, alignment charts, and fluid-flow curves presented through the courtesy of the Southern California Meter Association.

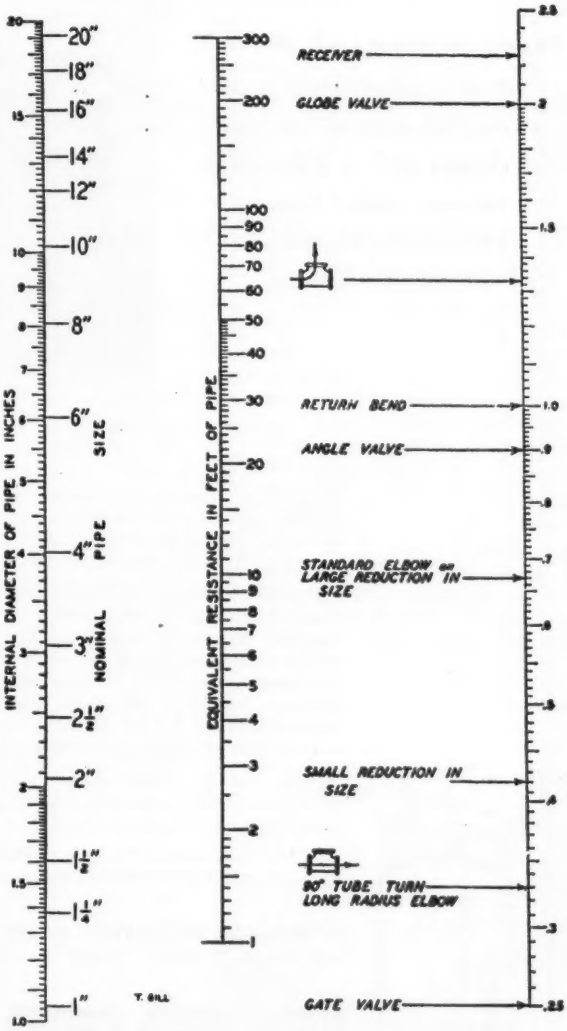
Minimum Wall Thickness for Oil Piping Inside Refinery Limits

(Includes Oil Vapors, Refinery Gas, and Natural-Gasoline Recovery Plants)


PRESSURE IN PIPE — POUNDS PER SQUARE INCH
MINIMUM WALL THICKNESS IN INCHES AT 100° F
TURNING SCALE
TEMPERATURE °F
DIAMETER
EXTERNAL PIPE SIZE
NOMINAL PIPE SIZE
BASED ON 100° F
TO CORRECT FOR TEMPERATURE, DRAW LINE FROM TEMPERATURE TO THICKNESS AT 100° AND GET POINT ON TURNING SCALE. DRAW LINE FROM 100° THROUGH THIS POINT AND GET CORRECTED WALL THICKNESS.

Based on 100° F. To correct for temperature, draw line from temperature to thickness at 100° and get point on turning scale. Draw line from 100° through this point and get corrected wall thickness. A.S.A.-B31-1935, allowable stress = 15,500 psi.

Equivalent Resistance of Fittings in Terms of Pipe-Line Length



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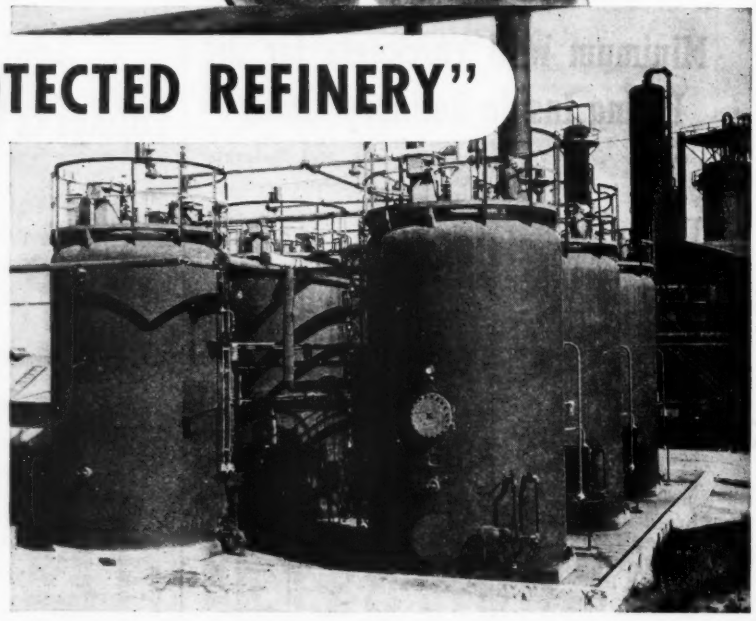

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Is *your* refinery ready to take on "all comers" in crude charges, or... is it limited to non-salty crudes? Here's how PETRECO's Electric "jab" will make it a "champ"!

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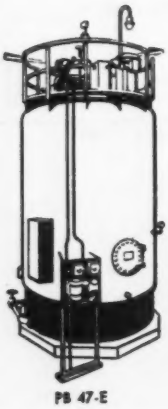
A little study of "border-line cases" invariably reveals: 1. *PETRECO Desalters enable the refiner to buy crude more advantageously and at no selective premium.* 2. *The safety factor present in a completely clean crude is sound refining practice.*

You may plan your desalting with Petreco without obligation. Call your nearest Petreco Engineer and review your salt situation with him. You are sure to benefit!



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REFINING

Small Catalytic Units Feasible, Speakers Say

CATALYTIC cracking units designed for refineries of small capacity are now in operation demonstrating that they can complete with thermal cracking and large catalytic cracking plants, speakers explained June 2 at the semiannual meeting of the Refining Division of the American Petroleum Institute at St. Louis.

The discussion at the St. Louis meeting by Davis Read, Universal Oil Products Co., and George Kelso, Houdry Process Corp., followed the presentation of a paper by A. P. Frame, Petroleum Advisers, Inc. (Cities Service), in which he projected a typical refinery in 1950 processing 100,000 bbl daily and compared it with a typical plant of 1938 refining 75,000 bbl. daily. (The Oil and Gas Journal, June 7, page 38).

In his discussion Frame indicated that the trend toward higher octane numbers of motor fuels would work a special hardship on small refiners who would not be able to justify the comparatively high investments and operating costs per barrel of finished products.

Both Read and Kelso gave data on costs based on actual operation of catalytic cracking units since the war. While agreeing installation costs with the catalytic units are higher than with the thermal operations, they said over-all operating returns compared favorably with thermal and large-scale catalytic operations.

"During the war considerable experience was gained in the design and operation of six catalytic cracking units having gas-oil charge capacities of 5,000 bbl. per day or less," Read explained. "Included among these was one 2,600-bbl. unit which now produces about 1,200 bbl. per day of motor gasoline. Of these six units, one was originally purchased by the refiner, three have been purchased from WAA, and the purchase of the remaining two units is being actively negotiated at present.

"Four of these units are now in successful operation producing motor gasoline and distillate fuels economically. In addition, since VJ Day, seven smaller refiners have each decided to install a new catalytic unit having a charge capacity of 5,000 bbl. per day or less. One of these is now in operation. It would appear that some progress is being made by the smaller refiner in modernizing his operations to meet competition."

Read gave the following comparison of estimated installation and operating costs for small-scale operations:

INSTALLATION COSTS

	Thermal cracking	Fluid catalytic cracking
3,500 B.S.D. thermal cracking	$900,000	
3,500 B.S.D. vacuum distillation		$ 150,000
2,870 B.S.D. fluid catalytic cracking		1,100,000
Total	900,000	1,250,000
$/bbl. of gasoline produced	$500	$700

DIRECT OPERATING COSTS, CENTS/BBL. OF FEED

3,500 B.S.D. Thermal cracking	25	..
3,500 B.S.D. vacuum distillation	..	7
2,870 B.S.D. Fluid catalytic cracking	..	35

Plants Held Blameless in Texas City Disaster

A REPORT early this week by George Armistead, Jr., Washington consulting chemical engineer, for John G. Simonds & Co. of New York, oil refinery insurance underwriters, held that oil and chemical plants were "not to blame" for the disaster at Texas City.

Armistead, author of "Modern Refining Processes," a series of articles appearing in The Oil and Gas Journal of which 17 already have been published, said the disaster was caused "wholly by two ship explosions."

"The cause was wholly from the explosions of the two cargo vessels which both disintegrated at the Texas City docks within about 16 hours of each other," Armistead's report said.

"It is true," he reported, "that intense fires immediately resulted in oil and chemical plants as direct results of the ship explosions. Such fires spread somewhat and wrought some of the destruction of life and property."

However, he continued, "no explosive substances, in the usual sense of ordnance materials or the like, were found to have been employed in the oil or chemical plants nor were there indications of detonations of such materials within the devastated properties of these industries at Texas City.

"It is manifestly impractical to consider building large industrial installations such as chemical plants or oil refineries which would withstand such terrific punishment as the detonation of 1,000 tons of ammonium nitrate within a few hundred feet. Terrific concussions and the hurling of heated missiles into chemical-processing, oil refinery, and storage areas handling these combustible materials occurred from the ship explosions.

"Under such conditions casualties and fire were unavoidable. The only practical protection against such disasters is the safe handling of large quantities of explosive materials such as ammonium nitrate."

Fred O. Clark, president of the insurance company, said many "alarming statements" tending "to make oil and chemical industries at Texas City responsible for the disaster" had been heard.

Armistead's report said there was no evidence of "explosions" on oil or chemical properties at Texas City "effecting destruction outside their limits," but that a few cases of tank failures with very localized consequences had occurred.

Coal-Conversion Plant To Produce Smokeless Fuel

Disco Co., a subsidiary of Pittsburgh Consolidation Coal Co., June 4 announced plans to begin construction immediately on a $3,000,000 coal-conversion plant and tar refinery.

The plant, to be built 19 miles west of Pittsburgh, will make a smokeless solid fuel and will refine coal tar into chemicals. The announcement was indicative of efforts of the coal industry toward a more complete utilization of its basic product and improvements in coal as a fuel in view of the steady encroachment of oil and natural-gas into its markets.

Pittsburgh Consolidation Co. recently announced a program of cooperative research with Standard Oil Development Co. for the development of a commercial process for the syn-

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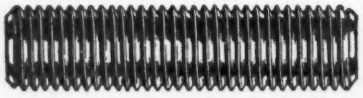
● DOUBLE END STUD



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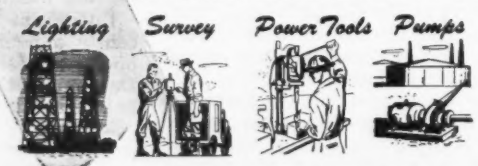

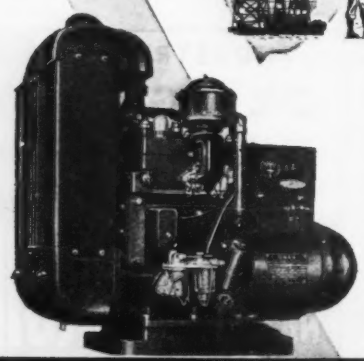

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ONAN ELECTRIC PLANTS

thesis of coal into motor fuel and heating gas. The Disco announcement said its plant will be the first to use a low-temperature process on a large scale and will produce 800 tons daily of the solid smokeless fuel as well as four primary tar products: tar acid oil, creosote, fuel pitch, and pitch coke.

Ashland Dubbs Unit Makes 124-Day Run

The Dubbs unit at the No. 1 refinery of Ashland Oil & Refining Co., Catlettsburg, Ky., has resumed operations after a 3-week shutdown which followed the longest run in the unit's history.

The unit completed a run of 124 days, 13 days short of the longest run ever made by a Dubbs unit, according to Roland Whealy, refinery superintendent. During its long run, the unit was charged with 1,028,519 bbl.

Gulf Announces New Marine Gasoline, Oil

A new higher-octane marine gasoline and a new premium-quality marine oil have been developed by Gulf Oil Corp. During the curent month, the two products will replace former lines handled by Gulf's marine-dealer outlets along the coast and on many inland waters.

The new gasoline is a straight-run product, entirely unleaded and undyed. The new oil, engineered specifically for marine use, is nonfoaming even at high temperatures and when contaminated with water, according to a Gulf announcement.

Sun Reports Gains in Output of Fuels, Lubes

Sun Oil Co. has stepped up its output of motor fuel more than 15 per cent and lubricating oil more than 50 per cent in recent months, according to Samuel B. Eckert, vice president in charge of marketing.

Eckert said the increased production was made possible "solely by modifications and improvements in operating methods in existing plants." Eckert said efforts to step up production resulted from the "unprecedented demand which now is greater than the highest level reached during the war."

Japanese Data Published

Technical data on Japanese fuels and lubricants during the war, obtained by the U. S. Navy Technical Mission in Japan, are contained in 10 reports being distributed by the Office of Technical Services of the Department of Commerce.

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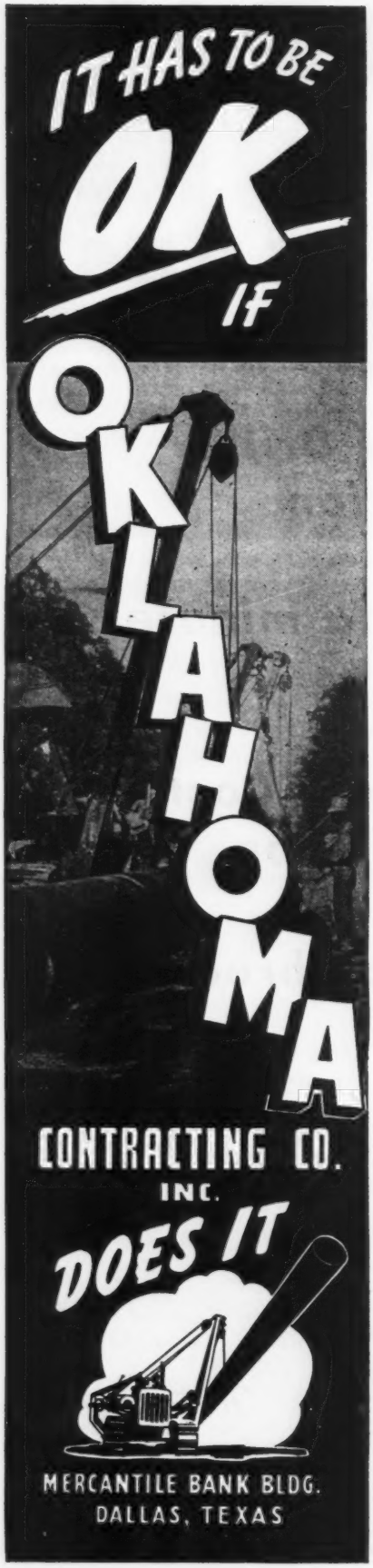

PIPE LINES

Stanolind Completes 20-in. Looping Project This Week

By the end of this week all of the 178 miles of 20-in. will be laid for Stanolind Pipe Line Co.'s looping program carried on this year between Drumright, Okla., and Freeman, Mo. The work was contracted as follows: Midwestern Constructors, Inc., one section; Ray L. Smith Construction Co., two sections; and Oklahoma Contracting Co., one section.

Malco Sells Gathering System to Stanolind

Stanolind Pipe Line Co. has acquired gathering-system facilities in connection with the deal recently made with Malco Refineries, Inc., as a result of which Stanolind will build a 73-mile 8-in. line from the Caprock field of New Mexico to Slaughter, Tex. The gathering facilities serve the Caprock, Grayburg and Square Lake, N. M., areas.

Stanolind plans to lay 25 miles of 6-in. from the Grayburg and Square Lake areas to Caprock. Contract for this line has not been let. After this line has been laid, the use of an existing 27-mile 4-in. line west of Caprock will be discontinued; eventually Stanolind will take up this 4-in. line.

Crude for Malco's Roswell, N. M., refinery will be supplied via Malco's Eddy County pipe line, according to Robert O. Anderson, president, Malco Refineries, Inc. As a result of the construction of Stanolind's 8-in. line to connect with the main 16-in. line at Slaughter, it is predicted that extensive drilling will get under way soon.

Smith Contracting Co., which has contracted the 8-in. line to be laid for Stanolind, already is engaged in ditching; pipe laying operations are expected to commence June 20.

Sinclair Pipe-Line Offices Move to Independence

The Tulsa executive department of the pipe-line division of Sinclair Refining Co. and the stock materials and highway equipment departments are being moved from the seventh and eighth floors of the National Bank of Tulsa Building, Tulsa, to Independence, Kans., where the pipe-line division has extensive offices in the old Prairie Oil & Gas Co. Building.

The headquarters of the Sinclair Products Pipe Line Co., now located at Columbus, Ohio, will be moved to Independence also, according to Rex Cowan of the pipe-line division.

Some foremen in the pipe-line division in Tulsa will be moved to Bristow to be located nearer their field operations.

Roy Tibbetts, vice president and general manager of the pipe line division of Sinclair Refining Co., who succeeded John R. Manion May 1, is

HEARNE, TEX.—AN IMPORTANT STATION POINT

The Hearne, Tex., crude-oil pump station of Humble Pipe Line Co. is located at a strategic point in Texas pipe-line transportation. On the grounds of the station there also is a pump station for Humble's butane line from East Texas to the Gulf Coast. In the vicinity of the Hearne station, a pump station has recently been built for the refined-products pipe line from Baytown to the Dallas-Fort Worth area. Sinclair Refining Co.'s products line being constructed this year from Corpus Christi to the Dallas-Fort Worth area will traverse an area in this vicinity near Bryan, Tex.

in charge of the pipe-line operations.

The Sinclair Prairie Oil Marketing Co., and the personnel of the claims, personnel, and medical departments of Sinclair Prairie Oil Co. will move from the National Bank of Tulsa Building to two top floors of the McFarlin Building in Tulsa.

Desert Truck Tests Under Way Near Yuma

TRUCKS are being tested in the desert near Yuma, Ariz., to determine requirements which must be met to assure satisfactory service under conditions in the Arabian desert.

Tests are being conducted under the supervision of H. A. McKim, vice chairman of the American Petroleum Institute central committee on automotive transportation, in conjunction with representatives of Arabian American Oil Co., Trans-Arabian Pipe Line Co., Williams Brothers Overseas Co., and Bechtel International, Inc. Tests are being observed by R. A. Conyes as representative of Bechtel International Corp. and by Guy S. Connors of Williams Brothers Overseas Co.

Performance data regarding trucks made by several manufacturers (which will furnish equipment for Arabian service) is being obtained by observing the effects produced by typical loads which are to be transported under desert conditions. Some comparisons will be made between results obtained by standard trucks and special truck equipment devised for desert service.

Trucks for hauling pipe trailers have been engineered for operating in sand and under temperatures as high as 125° to 130° F., requiring radiators twice the size of those normally used in the United States.

Among the first trucks being tested is a six-wheel vehicle designed by Kenworth Motor Truck Corp. which is 2 ft. wider than the largest used on United States highways. Front tires are 16.00-20 10-ply low-pressure sand models carrying 10 to 12-lb. pressure. Rear tires are 14.00-20, 8-ply. The trucks are equipped with a 300-hp. motor and two transmissions. Similar trucks manufactured by International Harvester Co. were tested.

Hidalgo-Monterrey Gas-Line Project Near Completion

Construction is scheduled for completion this week on the 150-mile line being built to deliver gas from the Hidalgo area of Texas to Monterrey, Mexico.

For Reynosa Pipe Line Co., a subsidiary of La Gloria Corp., Ladewig Engineering Co. has been laying 16 miles of 12¾-in. pipe from South Weslaco field in the Hidalgo area to a point on the Rio Grande River where it connects with 134 miles of 14-in. pipe which has been laid for Gas Industrial de Monterrey, S.A., by Constructura del Norte, S.A., a subsidiary of O. C. Whitaker Co.

According to present schedules, it is expected that gas will be turned into the line late in June.

Radio Units Save Time on El Paso Natural Project

In the use of Motorola two-way radio units installed in cars and at headquarters stations in connection with the construction of El Paso Natural Gas Co.'s 26-in., 740-mile line from West Texas to Blythe, Calif., much time has been saved through quick communication. Foremen can talk readily with each other and with headquarters in regard to all details in construction operations.

Usually there is no interruption of the stations because the facilities provide for communication only within a radius of 50 miles. However, there are rare occasions when conversation is possible with distant points. A case cited recently occurred when two foremen on the spread near Lordsburg, N. M., could not communi-

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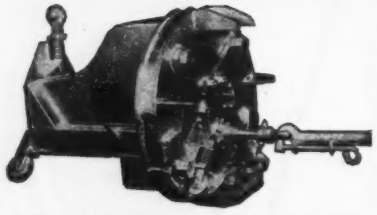

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cate with each other by radio, although they were only a few miles apart, due to certain atmospheric conditions. It happened that a short wave operator in New Hampshire could hear both of them, and he relayed the messages which they wanted to send each other. Within a few minutes conditions changed and since then they have not heard the New Hampshire station. At different times the Lordsburg foremen have had radio contact for periods of a few minutes at a time with a drilling rig in Louisiana; the United Gas Pipe Line Co. organization at Monroe, La., and a shrimp fleet working off the Gulf Coast.

In a recent election of the employes of El Paso Natural Gas it was voted not to join the CIO union. The vote, 86 to 116, included a high percentage of the eligible employes.

Texas Pipe Line Takes Up 138-Mile Products Line

The Texas Pipe Line Co. has announced award of contract to Associated Contractors & Engineers for the taking up of a 138-mile gasoline pipe line in East Texas.

The company said the pipe, of 8⅝-in. size, will be salvaged and reconditioned.

The line runs from Marsh Junction, near Port Neches, to Logansport, in Shelby County.

Poe Firm to Continue As Texas Eastern Consultant

While E. Holley Poe has resigned as president of Texas Eastern Transmission Corp., he and his firm of E. Holley Poe and Associates will be retained as consultants.

"It was a question of whether to devote all my time to Texas Transmision or to continue to take an active part in my other activities," Poe explained in New York this week. Poe remains on Texas Eastern's board of directors. Hilding Carlson, assistant secretary-treasurer of Texas Eastern also resigned. Carlson is associated with Poe.

Poe and Carlson expect to do considerable foreign travel in connection with various business projects now pending.

Italian Gas Line Planned

Plans are being made for a $10,000,000 natural-gas pipe line in Italy from gas fields in the delta of the Po River near Rovigo to Milan; a branch line will extend to Bergamo.

Later extension may transmit gas north to Venice and south to Florence. According to reports the project is being planned by J. D. Creveling, Chicago.

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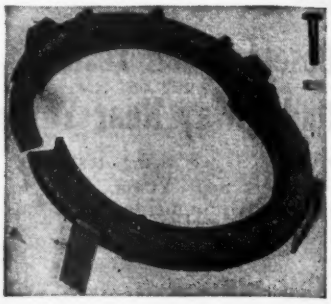

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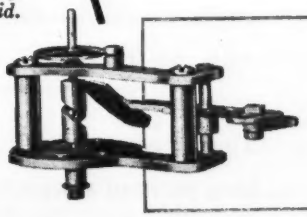

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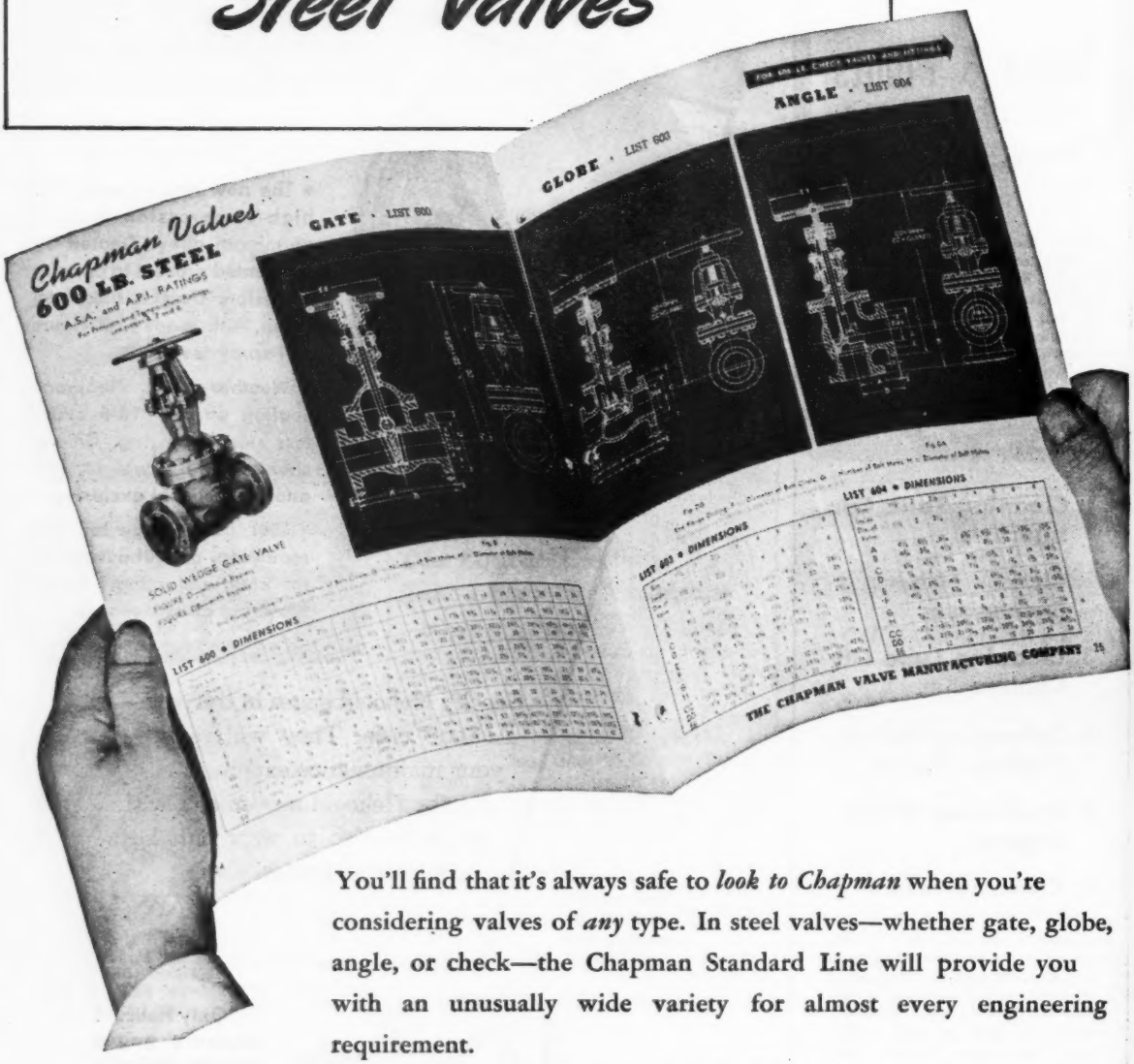


You'll find that it's always safe to *look to Chapman* when you're considering valves of *any* type. In steel valves—whether gate, globe, angle, or check—the Chapman Standard Line will provide you with an unusually wide variety for almost every engineering requirement.

That's because the Chapman Standard Line has been built up through long years of research and development.

If you need a special, custom-made valve, *look to Chapman* for help in its development, but be sure *first* to consult the Chapman Standard Line, because you may find there *the exact valve for your job.*

The Chapman Valve Manufacturing Co., Indian Orchard, Mass.

Natural Gasoline

Cities Service Improving Natural Gasoline Plants

CITIES SERVICE OIL CO. currently is engaged in modernization and improvement work at 10 of its natural-gasoline and chemical plants. The installations involved are in Texas, Oklahoma, and Kansas.

Some of the work represents war-deferred improvement; it also reflects increased demand for natural-gasoline and chemical plant products. Further modernization is planned later.

The plants and the work at each are:

Arkansas City, Kans.—Two 30,000-gal. L.P.G. storage tanks and L.P.G. tank-car loading facilities.

Burrton and Stone, Kans.—Plants consolidated, and Stone converted to booster station to be used in conjunction with Burrton. Consolidation expected to increase residue available for Cities Service Gas Co. Two new 30,000-gal. storage tanks at Burrton.

Wichita.—Increase in L.P.G. storage capacity.

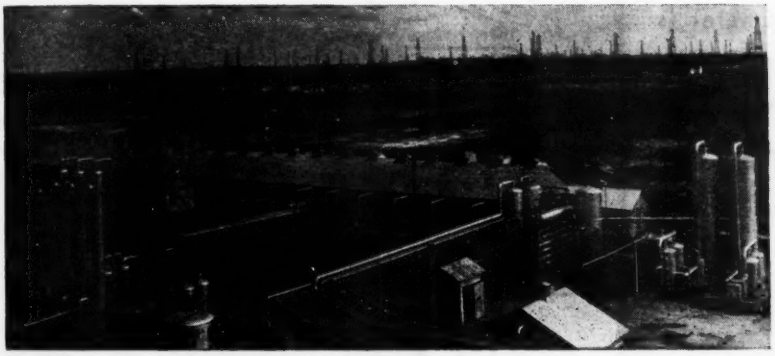
Odessa, Tex.—Installation of 800-hp. angle-type, engine-driven compressor with auxiliary equipment. Gathering system revamped, and additional wells connected.

Pampa, Tex. — Old equipment replaced, additional storage, cooling-system improvements. Plant to produce propane as well as butane.

Tallant, Okla. — Electrification of all pumping equipment, piping streamlined.

Jones and Bodine, Okla. — Plants consolidated with Jones shut down. Yard piping revamped, and processing equipment rearranged.

Button, Okla. — Changing engine jacket-water system to closed water system for increased recovery of products.



This natural-gasoline plant is included among the 10 involved Cities Service Oil Co.'s current modernization and improvement program. It is the Bodine plant showing the revamped yard piping. The Oklahoma City field is in the background. The picture was taken by Frank Allen, Cities Service plant superintendent in the Oklahoma City-Seminole district

Natural Gas News

Oklahoma-Kansas-Texas Gas Compact Proposed

PLANS for the organization of an Oklahoma-Kansas-Texas compact which would concern itself with providing natural gas for industrial development within the three states and with possible uniform taxation on the gas industry, have been disclosed by Roy J. Turner, Oklahoma governor.

Turner said he had discussed the proposal with Gov. Beauford Jester of Texas and with Kansas Corporation Commission officials. A meeting of Jester, Turner, and Gov. Frank Carlson of Kansas may be held later in Oklahoma City, Turner said.

Turner declared 70 per cent of the gas produced in the Texas and Oklahoma panhandle fields and in southwestern Kansas now goes to northern and eastern markets. He said B. F. Goodrich Co. and Corning Glass Co. could not get guarantees of sufficient gas supplies in Oklahoma. "We want to attract industry to this section of the Midwest, and we can do it if we organize," he asserted.

As for taxes, the Oklahoma governor said that unless all three states had identical severance taxes, production in the other adjoining states would suffer.

Nine Michigan Industrial Gas Consumers Cut Off

Pointing up the predicted shortage of natural gas again next winter, Michigan Consolidated Gas Co. has notified nine large industrial customers in Muskegon their service will be terminated at the end of this year.

The action is expected to result in trebled fuel bills for the affected companies. Michigan Consolidated's affiliate, Michigan-Wisconsin Pipe Line Co., has Federal Power Commission approval for a Texas-Michigan pipe line but it is not expected to be completed before about 3 years.

Though broadly indicative of the near certainty of a continued shortage of gas in the east and north this winter, the termination of supplies to the Muskegon companies reflect largely local conditions in that the area has been served from Michigan gas wells which are being rapidly depleted, it was said. The nine manufacturing companies must switch to propane or manufactured gas, and Michigan Consolidated is making necessary changes at its own expense to install propane-burning equipment in all the plants.

Action Postponed on Alabama-Tennessee Plan

WASHINGTON.—The Federal Power Commission has postponed further action on the application of Alabama-Tennessee Natural Gas Co. for authorization to build and operate transmission facilities in Alabama.

The action was taken at the company's request which stated the company is considering major changes in the project in order to sell gas to Mississippi and Alabama communities other than those originally proposed for service.

The application originally had been consolidated with those of Southern Natural Gas Co. and East Tennessee Gas Co. for hearing May 26 in Chattanooga. Southern Natural proposes to build several lines in southeastern areas and to increase system capacity to 384,000,000 cu. ft. daily. East Tennessee seeks approval of a plan to build facilities to serve Chattanooga, Knoxville, and surrounding areas.

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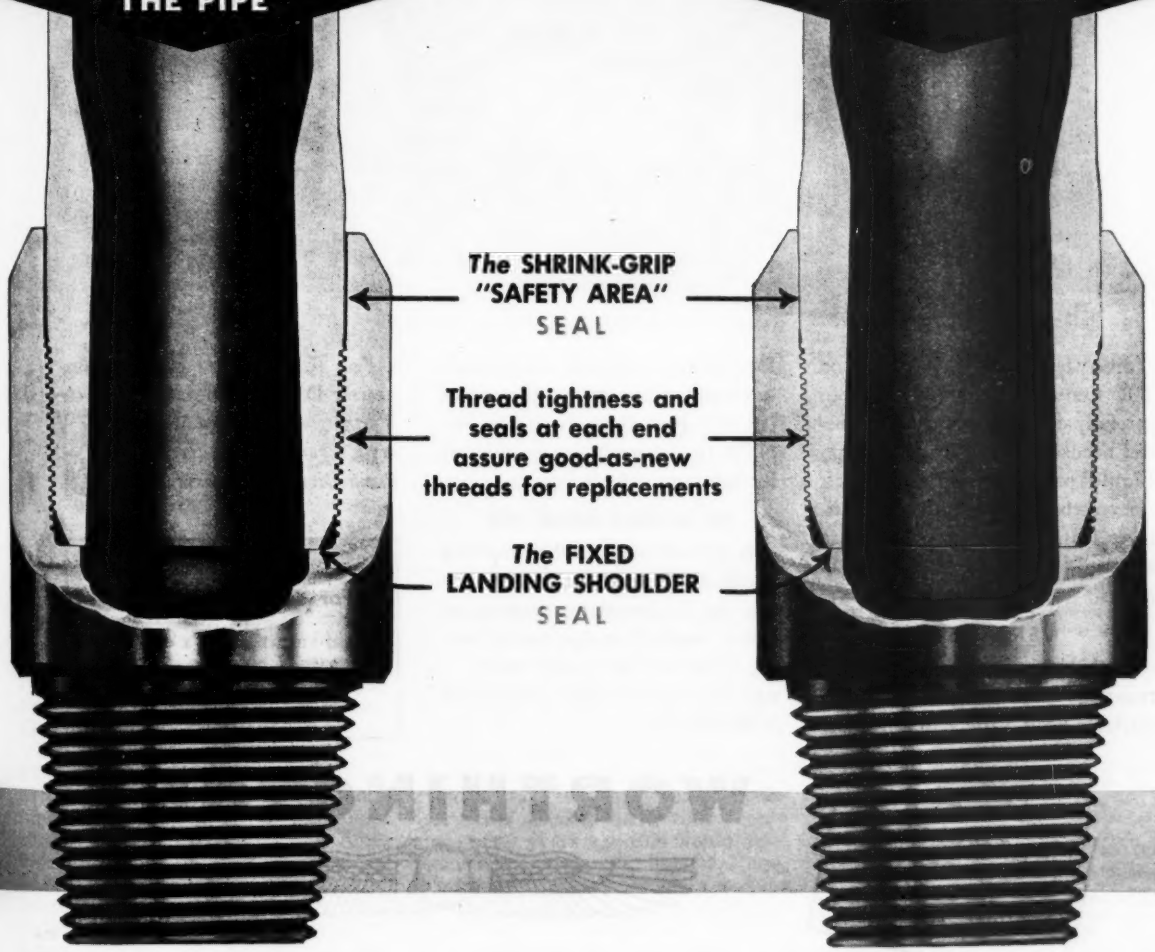
The SHRINK-GRIP "SAFETY AREA" SEAL
Thread tightness and seals at each end assure good-as-new threads for replacements
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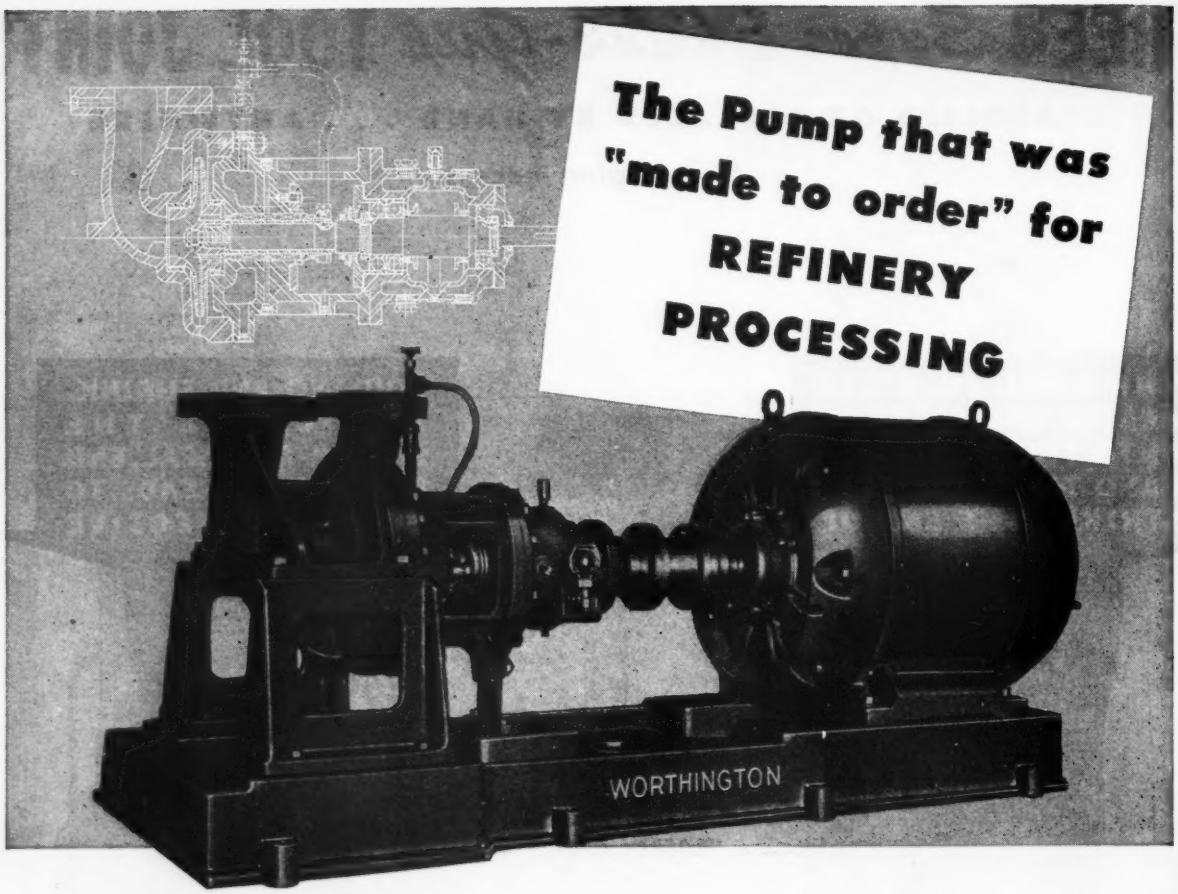

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VERSATILE!

Both the single-stage HR and two-stage HB, for higher heads, are available in a variety of materials for different temperature, pressure or corrosive conditions. (See panel below.) And both have the low N.P.S.H. characteristics so desirable for handling volatile liquids.

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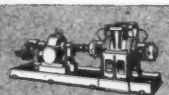
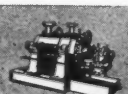
Types HR and HB. Twenty sizes. Capacities up to 1800 g.p.m. Developed heads up to 900 ft. Proper selection of material benefits use for temperatures far below zero to 800°F., for pressures from high vacuum to 750 lb. per sq. in. gauge.



Type HD. Hydraulically-balanced, double-suction impeller handles boiling liquids with low submergence. Capacities range from 600 to 3200 g.p.m. at heads up to 700 ft., temperatures up to 850°F., pressures up to 550 lb.



Type WH. High-pressure, high-temperature, centrifugal hot-charge pumps. Twelve distinct points of superiority, based on years of experience building pumps for high pressures and temperatures. Capacities to 9000 g.p.m., heads to 5000 ft.

Type HL. Several construction arrangements permit flexibility in application. Designed for temperatures up to 225°F., or higher with water-jacketed stuffing box. Capacities up to 1600 g.p.m., heads to 500 ft.

Exploration and Drilling

Southwest Kansas Prospects

OPERATORS who keep an eye on developments in southwestern Kansas outside Hugoton field are watching Helmerich & Payne 2 Adams, in 36-34s-30w, Meade County. Pipe has been set at 6,400 ft., and preparations being made to drill out plug to test saturation in the Mississippi lime.

This is another in a series of tests along the Kansas-Oklahoma border, in Meade and Seward counties, Kansas, and in Beaver County, Oklahoma, where there is just enough result to encourage more searching, but to date, nothing of any particular importance. In a broader regional sense, it is part of the same play as the Keys pool development in Cimarron County, Oklahoma, and also oil developments in Kearny, Finney, Ness, and Scott counties in Kansas.

South of the Helmerich & Payne test, Stanolind Oil & Gas Co. has opened gas and perhaps some condensate from the Mississippi lime on the Adams ranch in 8-35-30. About 20 miles west, Stanolind 1 Feathers, in 15-35-33, after testing the Arbuckle at 8,243 ft. (making it Kansas' deepest test), backed up and found gas and some condensate in a Pennsylvanian sand on top of the Mississippi lime.

South and east of the Stanolind Feathers test, but across the line in Beaver County, Oklahoma, H. L. Hunt 1 Light, in 9-6n-21ecm, found gas and some condensate in the Mississippi lime.

In most of the wells producing from the Mississippi lime, there was at least a good show of gas, and sometimes traces of oil, in the Pennsylvanian sand just above the lime. This sand, or if not exactly the same geological formation, a sand at the base of the Pennsylvanian, is what is producing in Keyes field in Cimarron County. The Keyes area lies about 75 or 80 miles west and a little south of the westernmost Kansas line tests.

Farther north in Kansas, Patterson, Nunn, and Shallow Water pools in Finney, Kearny, and Scott counties, respectively, and Aldrich, Arnold, Kansada, and Manteno pools in Ness County, have a combined total of between 55 and 60 wells producing around 1,600 bbl. daily, all from the Mississippi lime except Patterson. Patterson, with three wells making a little over 100 bbl., produces from a Pennsylvanian sand.

In the broad regional sense, all the fields and wildcats mentioned are part of the northwestern Anadarko basin play. They may be considered either as in the shallower part of that basin as it rises to the north and west, or as down flank off the Las Animas uplift in southeastern Colorado.

The geological section is different in many respects from that farther east in Kansas, or on the Central Kansas uplift. The Mississippi lime section is much thicker, and a substantial thickness of the upper or younger portion of that formation is present that is not present in eastern Kansas.

There is an unconformity, probably a major unconformity, at the top of the Mississippi lime. Just above this a Pennsylvanian sand is found. However, the sand that has been found in various areas of the region is probably not an exact geological equivalent in every case. In fact it is fairly certain that at least two, and perhaps more, different geological formations are involved.

The Mississippi section is more like that of Illinois than of eastern Kansas or northern Oklahoma, and Illinois nomenclature is being used to some extent by the geologists in identifying the various sections.

Various zones of saturation have been found in the lime, but to date, most of the tests along the Kansas-Oklahoma border have found only gas. A few years ago this would have seemed worthless, so close to Hugoton where there was such a surplus of gas. Now, with the big trunk gas lines and a projected Fischer-Tropsch process refinery seeking Hugoton gas reserves for a backlog, even gas development here may be sought after in a few more years.

Very few Arbuckle (Ordovician) tests have been drilled, none finding anything yet. Those geologists who hold that a certain amount of thinning in the Mississippi cover is essential to oil accumulation in the Ordovician, do not think Arbuckle prospects are bright. However, other geologists feel that even though this theory may hold in some geological provinces, it does not follow that it will be true here.

EASTERN TEXAS

San Augustine Test Having Tubing Trouble

DALLAS.—San Augustine County's prospective discovery, M. E. Davis 1 Johnson, north of the town of San Augustine, was having trouble running tubing. After running 30 stands, the well headed mud, with some oil. It was allowed to blow before mud was pumped in to kill the well. Perforations are at 8,130-60 ft., in the Pettit limestone, from which a drill-stem test indicated commercial oil production.

Magnolia Petroleum Co.'s Houston County wildcat, the 1 J. W. Grounds, continued testing various levels. The upper Glen Rose at 8,395-8,435 ft. was swabbed for 11 hours, showing wash-water and gas. Shut in over night, fluid rose 1,100 ft. Subsequent swabbing showed wash-water and oil. A retainer was set at 8,385 ft. and perforations squeezed. Operators then drilled out to the Rodessa but plugged back and perforated in the Glen Rose around 8,400 ft. After acid treatment, it recovered only a small amount of oil, and operators squeezed all perforations.

In Freestone County, The Texas Co. 1 W. M. White was testing the Woodbine at 4,197-4,200 ft. On a drill-stem test, the water cushion hit the surface in 15 minutes and the well cleaned itself in 30 minutes, flowing gas at a pressure of 1,200 lb. Operators pulled the tool to make a production test at that depth.

Two Anderson County exploratory wells were under way. Continental Oil Co. 1 Royall, 2½ miles northwest of Slocum, was drilling below 5,862 ft. in shale. Top of the Woodbine at 5,148 ft. had a stain of oil but drill-stem tested water.

A wildcat Travis Peak test, 2 miles southwest of Bazette, Navarro County, reported shows of oil. J. L. Collins Co. 1 Mrs. Lilly Barnett had showed porous limestone having a good show of oil from samples at 5,386-91 ft. A 30-minute drill-stem test produced a good surface blow but recovered only 180 ft. of salt water and mud, with a slight show of oil and gas on top. Operators prepared to drill ahead below 5,391 ft.

EAST TEXAS WILDCAT FAILURES

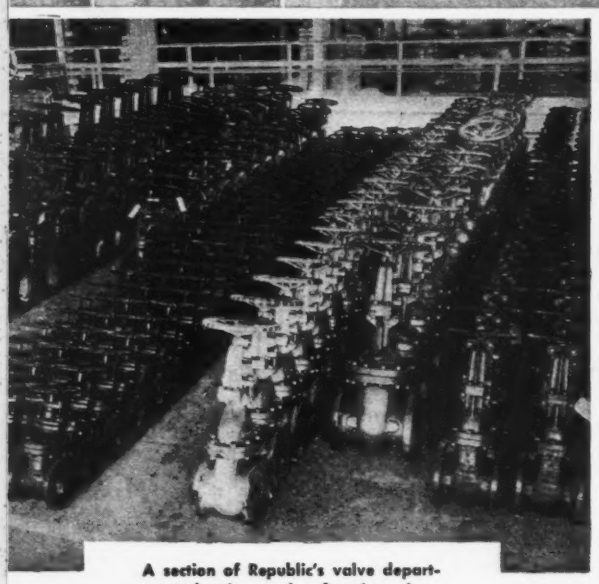
Bowie County: Tide Water and Seaboard Oil Co. 2 Dalby & Joiner, D. Puckett Sur., in Dalby Springs area, dry, TD 4,878 ft., top Paluxy by samples 4,526 ft.

Freestone County: C. L. Brown 1 J. J. Beasley, J. Trudhoe Sur., 3 mi. NE Teague, dry, TD 4,335 ft., Woodbine sand 4,310 ft.

Kaufman County: J. C. Moore 1 S. D. Stanfield, Wesley Boles Sur., 8 mi. SW Kaufman, dry, TD 2,206 ft.

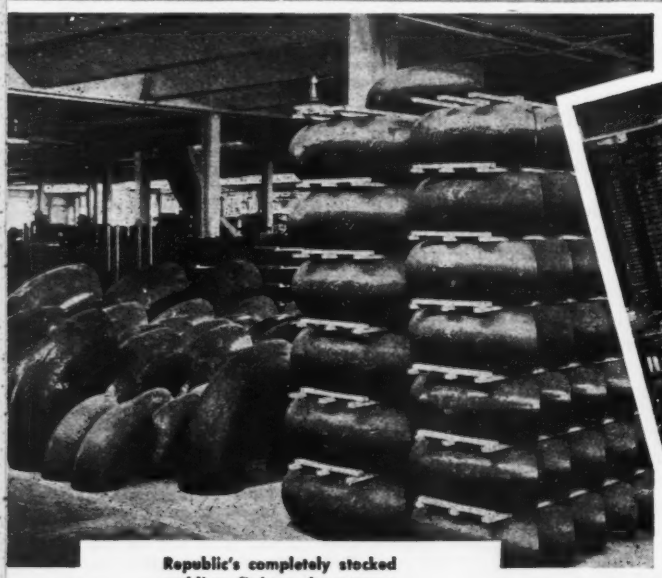
Rusk County: Chicago Corp. 1 H. H. Morris, A. E. Smith Sur., 4 mi. S Henderson, dry, TD 7,504 ft., Navarro chalk 2,093 ft., Austin 3,185 ft., lower Cretaceous 3,358 ft., Paluxy 4,432 ft., Glen

MODERN REFINE



A section of Republic's valve department showing stocks of various sizes.

Plug valve stocks at Republic's new central warehouse and store in Houston.



Republic's completely stocked welding fittings department.

Partial view of flange stocks maintained at Republic's new central warehouse and store.

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* District offices and stores. † Sales Office.

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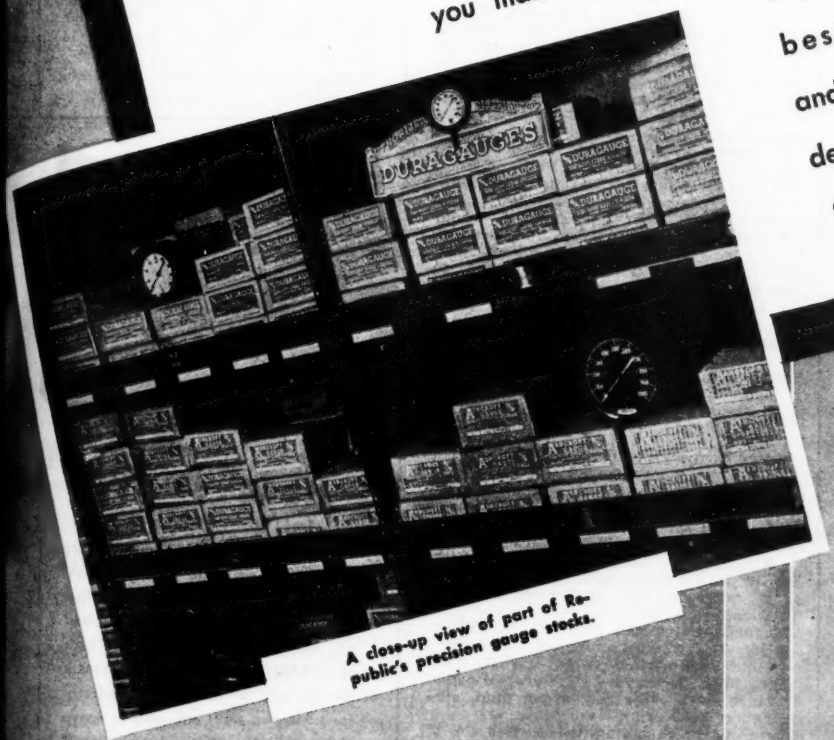
Your Supply Store



A close-up view of part of Republic's precision gauge stocks.

Republic Supply COMPANY

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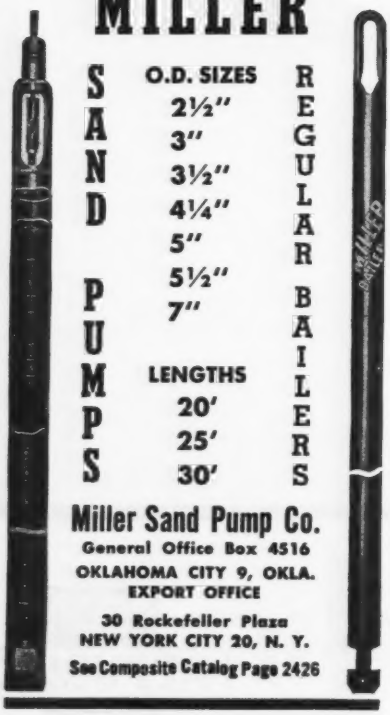
CABLE & STINE
WICHITA FALLS, TEXAS

INCREASE PRODUCTION
Clean Out With
MILLER



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2½"
3"
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5"
5½"
7"

LENGTHS
20'
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30'

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See Composite Catalog Page 2426

Rose 4,712 ft., Massive 6,143 ft., James 6,843 ft., Pettit 7,083 ft., Travis Peak 7,362 ft., shows of oil in Pettit at 7,288-7,320 ft.

N. CENTRAL TEXAS

Stephens County Gets New Lime Production

WICHITA FALLS.—New Mississippi limestone production was reported for Stephens County at J. A. McCarty and J. P. Coleman 1 Tipton, a wildcat in the northwest corner of the county, 8 miles south of Woodson field in Throckmorton County. Details were not available but it was said to have perforated at 4,524-34 ft., and started flowing oil after being swabbed down. Saturation also was reported in the Caddo formation at 3,698 ft., which was not tested.

Ten miles west of Throckmorton, Tom F. Hunter 1 J. B. Mathews, Block 60, Comanche Indian Reserve, made a 2-hour drill-stem test of the lower Caddo at 4,489-94 ft. recovering 1,100 ft. of clean oil and 600 ft. of heavily oil-cut mud. Operators may drill ahead to test the Mississippi limestone before making production tests. It will open a new deep pool for the area.

Continental Oil Co. last week was getting under way at its wildcat near the south edge of the city limits of Wichita Falls. The test, 1 Shem Cunningham, is a 6,000-ft. rotary project. Seven miles south of Wichita Falls, Fain & McGaha 2-A Ford, a 4,200-ft. wildcat in the Fitzgerald Survey, spudded in and was drilling below 2,000 ft. Three miles west of Wichita Falls, Joe Hale et al 1 J. H. Allison, a semi-wildcat in the J. Nicholson Survey, reported sand with rich saturation at 4,239 ft. Operators were to drill deeper and set pipe for a production test.

In eastern Archer County, 3 miles southeast of Scotland, Panhandle Refining Co. 1 Zotz, Lot 52, Block 3, Clark & Plumb Subdivision, reported Strawn sand with good showing of oil from 4,058-72 ft. A 1-hour drill-stem test at that depth recovered 60 ft. of clean oil and 80 ft. of oil-cut mud. Cores indicated additional pay sand to 4,088 ft. Operators were drilling ahead below 4,125 ft., in shale.

NORTH CENTRAL TEXAS SUCCESSFUL WILDCAT

Archer County: R. C. Dublin 1 R. Campbell "C," J. Ruddell Sur., A-355, 4 mi. S Anarene, pumped 181 bbl. 39°-gravity oil, Gunsight limestone 1,000-04 ft., TD.

NORTH CENTRAL TEXAS WILDCAT FAILURES

Baylor County: Ward & McCullough Drilling Co. 1 T. K. Wall, J. B. Barlay Sur., 5 mi. SE Seymour, dry, TD 1,340 ft.

Clay County: Continental Oil Co. 1 Fred Keene, Sec. 2,698, TE&L Sur., 4 mi. SW Joy, dry, TD 6,518 ft., Caddo 5,465 ft., with show of oil, Barnett 6,114 ft., Ellenburger 6,315 ft.

Magnolia Petroleum Co. 1 O. L. Fisher, Blk. 114, Wood Co. School Land Sur., 4 mi. SE Buffalo Springs, dry, TD 6,665 ft., Ellenburger 6,514 ft., show oil 6,514-24 ft., DST recovered oil-cut mud, elevation 1,093 ft.

King County: Stanolind Oil & Gas Co. 2 R. B. Masterson, Sec. 1, E. L. Ribble Sur., 25 mi. NE Guthrie, dry, TD 4,600 ft., Reef limestone 4,486 ft.

Young County: D. R. Criswell 1 R. Allison, Sec. 26, TE&L Sur., ½ mi. S Orth, dry, TD 864 ft. in shale.

Davis & Jennings 1 G. R. Smith, Sec. 1,365, TE&L Co. Sur., 6 mi. SE Olney, dry, TD 5,090 ft., Caddo 4,170 ft., Mississippi 5,048 ft.

WEST CENTRAL TEXAS SUCCESSFUL WILDCATS

Fisher County: Texas Pacific Coal & Oil Co. 1-A J. B. Young, Sec. 3, W. E. Kaye Sur., 4½ mi. NW Hamlin, pumped 22 bbl. 37°-gravity oil a day, plus 200 bbl. water, limestone pay 3,107-15 ft., TD 3,115 ft.

Jones County: J. C. Hunter, Jr., 1 Josie Shanks, Robert Smith Sur. 192, 3 mi. NE Hawley pumped 149 bbl. 40°-gravity oil a day, with some water, Swastika limestone 2,364-97 ft., TD.

WEST CENTRAL TEXAS WILDCAT FAILURES

Brown County: Cherry & Kidd 1 Maude Browning, I. Rosseau Sur., 2 mi. E Brownwood, dry, TD 1,655 ft., Marble Falls 1,585 ft.

A. Tillman 1 E. F. George, E. A. Evans Sur. 603, 3 mi. W Thrifty, dry, TD 1,347 ft.

Jones County: Exploration Drilling Co. 1 G. E. Gabbard, Blk. 9, Goliad Co. School Lands, 4 mi. SE McCaulley, dry, TD 4,730 ft., Gotham 2,700 ft., Noodle Creek 2,820 ft., Saddle Creek 3,010 ft.

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A. G. Hill 1 B. L. Ellis, Sec. 28, Blk. 15, T&P RR Sur., 10 mi. SE Anson, dry, TD 2,462 ft. in sand and shale.

G. L. Reasor 1 J. W. Snyder, Sec. 30, D&DA Sur., 6 mi. S Stamford, dry, TD 3,745 ft., Saddle Creek 1,980 ft., Flippen 2,045 ft., Swastika 2,425 ft., Palo Pinto 3,640 ft.

Stephens County: Fred W. Manning 1 Emma L. Chesley "A," Sec. 50, Blk. 7, T&P Sur., 14 mi. SW Breckenridge, dry, TD 3,700 ft., Caddo 3,391 ft.

MICHIGAN

Garfield Pool Gets Three New Completions

SAGINAW.—Garfield oil pool in Newaygo County continued to interest Michigan operators as three more wells were completed with total initial potential of 1,500 bbl. a day. Field activities for the week resulted in 21 completions, while 18 new locations were announced. Eight of the completions were oil producers, 5 gas wells, 8 dry holes. Six of the failures were wildcats.

A 300-bbl. well was added to the Claybanks development in Oceana County. Small wells were reported in Allegan, Montmorency, Osceola, and Ottawa counties, but each was producing less than 10 bbl. a day. None of the wildcats showed promise. Deepest completion was the C. W. Teater 1 Keilholtz wildcat in Hinton Township, Mecosta County, abandoned at 4,642 ft.

MICHIGAN WILDCAT FAILURES

Allegan County, Cheshire Township: Ford Henry 1 A. R. Granat, SE NE SW 27-1n-14w, dry in Traverse limestone, TD 1,398 ft.

Saugatuck Township: Wilma Lyons 1 Edith Beilstein, C N½ NW NE 22-3n-16w, dry, TD 2,185 ft.

Clare County, Garfield Township: Samuel C. Hindman 1 Ferguson, SE SE NE 36-17n-6w, dry, TD 1,706 ft.

Kent County, Cannon Township: James J. McGerry, Tr., 1 Edward L. Paas, SW SW SE 5-8n-10w, dry in Traverse limestone, TD 2,422 ft.

Mecosta County, Hinton Township: Charles W. Teater 1 Francis Keilholtz, SE NE SE 11-13n-8w, dry, TD 4,642 ft.

Oceana County, Crystal Township: Charles W. Teater 1 Florence Patterson, SE NE SE 14-16n-16w, dry, TD 1,722 ft.

MISSISSIPPI

Testing Resumed in Chickasaw Wildcat

JACKSON.—Testing was resumed on an old wildcat in Chickasaw County, 3 miles southwest of Okolona. Davidor & Davidor were reported to have taken over Pan American Producing Co.'s 1 H. B. Carter, in 24-12s-4e, which was given up in February of this year as having only a show of oil and gas in the Cypress sand at total depth of 2,642 ft. The new operators set 10-in. casing at 1,090 ft., drilled plugs and fresh water broke in, presumably from below surface casing. Cleaned out to total depth, the well started heading fresh water and gas. Operators were to run casing to total depth, then deepen 500 ft. before making further tests.

In Clay County, Atlantic Refining Co. 1 R. G. Dunning, 12-19n-16e, was said to be running low. This test had expected to reach the Mississippi around 7,000 ft., but on last report was coring below 7,920 ft., and still in the Pennsylvanian. Elevation is 184 ft.

Amerada Petroleum Corp. 1 Dabney-Bonelli, Warren County test, ran casing to top of the salt at 4,505 ft., and had moved in 2¾-in. drill pipe for an attempt to drill through the salt. In Newton County, 3½ miles north of the town of Newton, J. J. Broadus, et al 1 Bank of Newton, was coring at 4,280 ft. in sand. Top of the chalk was 2,670 ft., with the Eutaw top at 3,770 ft., by samples.

MISSISSIPPI WILDCAT FAILURES

Forrest County: Superior Oil Co. 1 Cassie Bradford, SE SW NW 1-3n-13w, dry, TD 15,730 ft., reported show of 38° oil at 13,350 ft., DST recovered salt water

Greene County: Humble Oil & Refining Co. 1 Carlos Henderson, NW NW 32-5n-8w, dry, TD 10,229 ft., no shows.

Lincoln County: Rogers Lacy et al 1 Harvey Smith, SE NE 17-6n-7e, dry, TD 10,842 ft., Wilcox 4,084 ft., Midway 7,750 ft., Selma 8,560 ft., Austin 9,228 ft., Tuscaloosa 9,770 ft., Marine Tuscaloosa 10,347 ft., Massive sand 10,715 ft., elevation 472 ft.

Yazoo County: Southern Production Co. 1 H. T. Carley, NW NW 28-10n-4w, dry, TD 7,653 ft., Wilcox 2,475 ft., Midway 4,767 ft., Chalk 5,650 ft., Eutaw 6,054 ft., Tuscaloosa 6,847 ft., Comanche 7,501 ft., no shows, elevation 111 ft.

ALABAMA WILDCAT FAILURE

Monroe County: Clint Steinberger 1 Swift-Hunter Lumber Co., 18-8n-7e, dry, TD 4,731 ft., base Wilcox sand 1,270 ft., Selma 1,755 ft., Eutaw 2,925 ft., Tuscaloosa 3,236 ft., Marine Tuscaloosa 4,045 ft., Massive sand 4,154 ft., Comanche 4,540 ft., elevation 400 ft.

FLORIDA WILDCAT FAILURE

Franklin County: Magnolia Petroleum Co. 1 Florida State Block 5-B, off shore, near SW cor. 6-9s-8w, TD 697 ft., lost returns and stuck drill pipe, will skid rig and drill new hole.

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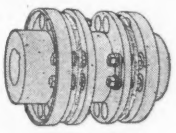
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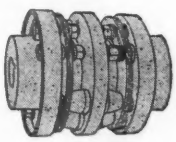
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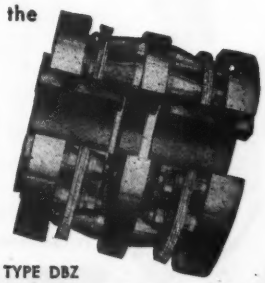
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PERMIAN BASIN

Pure Moving Tools for Bush Mountain Wildcat

MIDLAND.—Pure Oil Co.'s rank wildcat in the Bush Mountain range of Culberson County was moving in standard tools for a 6,000-ft. Ellenburger test, after spending several weeks building roads, drilling water wells, and getting the camp set up. Location is on a faulted structure. Pure's Pecos County wildcat, the 1 C. B. Harrison, 20 miles southwest of Fort Stockton, had total depth at 11,408 ft. in gray to white quartzitic sand and limestone. A drill-stem test at 11,342-408 ft., using a 2,000-ft. water blanket, produced a blow of air for 50 minutes, then sweet gas for 10 minutes, when the packer failed. A second test recovered 2,000 ft. of water ballast and 2,000 ft. of mud, both cut slightly with gas, but no oil, and operators drilled ahead below 11,450 ft.

Cities Service Oil Co. et al 1-B J. W. Owens, western Crockett County discovery, was reported to have flowed an average of 8½ bbl. of 41°-gravity oil an hour during a 5-hour test, from perforations at 5,645-50 ft. Gas flow with the oil was estimated around 4,000,000 cu. ft. a day. This test had indicated about 50 bbl. of oil an hour while drilling in the Wolfcamp around 5,600-5,700 ft. It blew out at 5,806 ft. and flowed wild for several days, making both oil and water, with considerable gas. Further tests showed salt water between 5,670-5,804 ft., and the test was carried on to 8,264 ft. in the Ellenburger, topped at 6,830 ft. That zone also showed water. Operators then plugged back to 5,675 ft. in an attempt to shut off water in the Wolfcamp.

Pure Oil Co.'s north extension test of Dollarhide field of southwestern Andrews County recovered 130 ft. of oil-cut mud and a 1,000-ft. water cushion in a 50-minute test at 6,781-6,875 ft., in the Wichita Albany, basal Permian. Flowing bottom-hole pressure was 500 lb., increasing to 1,050 lb. after shut in 15 minutes. A previous test with packer at 6,700 ft. recovered the water blanket plus 1,760 ft. of 41°-gravity oil and 100 ft. of heavily oil and gas-cut mud in 3 hours. Operators will drill ahead to the Ellenburger unless flush production is found in either the Silurian or Devonian zones, both of which produce in the Dollarhide field.

Sun Oil Co. had its first failure in Jameson field last week at its 2 Allen Jameson, Section 253, Block 1-A, H&TC Survey, ½ mile north of the discovery. A 1-hour test in the Crinoidal limestone at 6,485-6,510 ft. recovered 330 ft. of mud, with no shows. Operators planned to drill ahead to the Ellenburger.

Texas Pacific Coal & Oil Co. 14-D Jackson, Section 17, Block A-32, Public School Lands, flowed approximately 32 bbl. of oil the first hour and 35 bbl. the second hour, to become the Devonian discovery in the Fullerton field of northwestern Andrews County. Perforations were from 8,100-8,290 ft. The same company's 16-D Jackson, an offset on the south, recovered 6,000 ft. of oil on a drill-stem test at 8,275-8,340 ft.

WEST TEXAS WILDCAT FAILURE

Cochran County: Devonian Oil Co. 1 C. R. Starnes, Sec. 4, Harrison & Brown Sur., 2½ mi. SW Dean field, dry, TD 5,300 ft., anhydrite 2,370 ft., brown lime 3,920 ft., San Andres 4,300 ft., elevation 3,753 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—An Ellenburger test in Brunson field of Lea County, Rowan & Penrose & Walden, 15-22s-37e, took a drill-stem test at 7,646-92 ft. Gas came to the surface in 2 minutes, mud in 4, oil in 5. It tanked 20 bbl. of oil the first hour and 21 bbl. the second hour, flowing through ¼-in. choke. A second test at 7,699-7,745 ft. put gas to

the surface in 9 minutes, mud in 33, oil in 40, but the flow had decreased to slightly more than 12 bbl. of oil in 2 hours. Operators will drill deeper.

The Texas Co. 1-K State, SE SE 16-16s-38e, had total depth at 6,500 ft. and was preparing to drill ahead after a 6,000-gal. acid treatment failed to increase the oil. The well was acidized with packer set at 6,405 ft., then swabbed dry in 6 hours, recovering only 2 bbl. of fluid, and 1½ gal of oil.

SOUTHEASTERN NEW MEXICO WILDCAT FAILURE

Lea County: Allen Hargrave 1 State, SW SW 1-23s-34e, dry, TD 4,455 ft., anhydrite 1,725 ft., salt 1,985 ft., limestone 3,735 ft., Yates 4,028 ft., elevation 3,369 ft.

KANSAS

Meade County Well to Test Mississippi Lime Show

HELMERICH & PAYNE 2 Adams, SE SE SE 36-34s-30w, Meade County, has pipe set on bottom at 6,400 ft., to test saturation in Mississippi lime logged at 6,193-6,203 ft. Drill-stem test in the Morrow sand and top of Mississippi at 5,875-5,992 ft. recovered gas estimated at 2,500,000 cu. ft. per day. Great Lakes Carbon et al 1 Dirks, SW SW SE 16-18s-18w, Rush County, has pipe set at 3,838 ft., 2 ft. in the Arbuckle. Drill-stem test at 3,840-65 ft. recovered 1,200 ft. of fluid, 60 per cent oil, in 30 minutes.

Cities Service 1 Armstrong, SW SE SW 25-5s-22w, Norton County, about 5 miles west of the West Ray pool, has set pipe at 3,690 ft. to test oil shows in Lansing which was topped at 3,544 ft. Total depth is 3,881 ft. Gorham was logged at 3,790 ft.

Skelly Oil Co. 1 Martin, NW SW NW 8-26s-16w, Edwards County, has pipe set at 4,878 ft. to test Kinderhook, topped at 4,467 ft. Viola was logged at 4,520 ft., Simpson at 4,725 ft., and Arbuckle at 4,820 ft. Total depth is 4,880 ft.

Champlin Refining Co. 6 Hildebrand, SE NE NE 27-32s-15w, Barber County, in the Deerhead pool, which was originally completed January 1945 as a 10,000,000 cu. ft. gas well in Viola lime, has been rated a 3,000 bbl. well on bottom-hole bomb test, following an extended period of gradually increasing oil production.

KANSAS SUCCESSFUL WILDCATS

Rooks County: Vohs, Northwest opened by OWWO—Harbar et al 1 Baldwin, C N/2 NE SE 9-10s-19w, produced 773 bbl. of oil per day from Lower Kansas City at 3,442-50 ft.; Topeka 3,162 ft., conglomerate 3,657 ft., Simpson 3,694 ft., Arbuckle 3,727 ft., TD 3,771 ft., PB 3,500 ft.

Previous completion, new pool—Aylward Production Co. 1 Silvers, NW NW NE 21-8s-19w, swabbed 8 bbl. of oil in 8-hour test, IP 249 bbl. of oil per day, from Arbuckle at 3,466-73 ft., TD 3,473 ft., opened Silvers pool.

KANSAS WILDCAT FAILURES

Graham County: Palmer Oil 1 Manny, NE NE SW 28-8s-21w, dry, TD 3,760 ft., anhydrite 1,646 ft., Lansing-Kansas City 3,364 ft., Basal Kansas City 3,589 ft., conglomerate 3,696 ft., Arbuckle 3,736 ft.

Morris County: Brazil & Newton 1 Kurtenbach, NW NW NE 19-16s-6e, dry, TD 2,820 ft., Viola 2,498 ft., Simpson shale 2,779 ft., Simpson sand 2,799 ft., Wilcox 2,812 ft.

Sumner County: D. R. Lock et al 1 Potucek, NE NW NW 7-33s-2e, dry, TD 3,812 ft., Kansas City 2,828 ft., Mississippi lime 3,399 ft., Base lime 3,688 ft., Simpson 3,748 ft., Arbuckle 3,807 ft.

Woodson County: Ram Rock Drilling Co. 1 Probst, SE SE NE 26-25s-15e, dry, TD 1,426 ft., Mississippian 1,397 ft.

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LA.-ARK.

Tanks Being Erected at Union Parish Wildcat

SHREVEPORT. — Additional information on R. T. Seller et al 1 Monzingo-Rivers Lumber Co., 23-22n-1w, Union Parish wildcat 7 miles northwest of Farmersville, indicates it flowed oil and wash-water for 1 hour from perforations at 2,140-43 ft. before dying. The amount of flow was not gaged. It was then swabbed down to 400 ft. Shut in for 6 hours, fluid rose 600 ft. before perforations were mudded off. New holes at 2,143-45 ft. resulted in a flow of oil for 1 hour. It was swabbed and then flowed by heads. Shut in for 12 hours, it then flowed oil and gas through ⅝-in. tubing choke for 95 minutes at a tubing pressure of 15 lb. Operators were erecting tanks for a production test. Gravity of the oil is 29°.

A new Wilcox exploration was scheduled by Pan American Producing Co. in Catahoula Parish, 3 miles southeast of Sicily Island field and 8 miles northwest of Lake St. John field. It is projected to 6,000 ft. or deeper and will be the 1 Mrs. L. R. McGraw, SE SE SE 24-10n-8e.

Further tests at J. F. Lent et al 1 E. L. Whatley, 20-10n-10w, Natchitoches Parish, swabbed 8 to 10 bbl. of fluid an hour, of about 80 per cent oil, after a 500-gal. acid treatment.

In Union County, Arkansas, Arrow Drilling Co. 2-A Union Saw Mill, 3½ miles west of New London field, was preparing to skid the rig and drill another hole. McAlester Fuel Co. 1-A Texas Co.-Lee, McKamie field extension try, perforated 8,130-55 ft., drilled out to 9,061 ft. and took a drill-stem test. Open 3 hours and 51 minutes, it produced a slight blow throughout, with no working pressure Recovery was the water cushion, mud and salt water.

ARKANSAS WILDCAT FAILURES

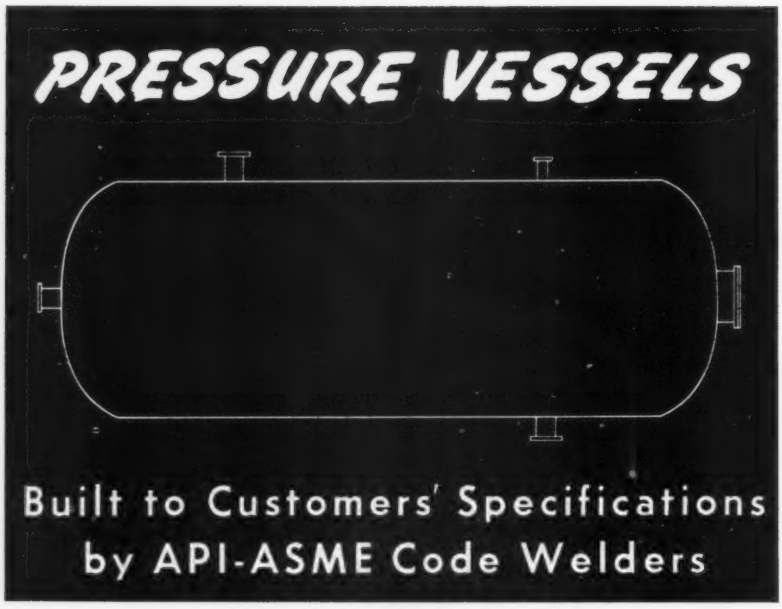
Ashley County: McAlester Fuel Co. 1-B Crossett, NE SW 28-16s-6w, dry, TD 3,810 ft.

Lafayette County: Chicago Corp. 1 Baker-Strange Realty Co., SE NW NE 11-16s-24w, dry, TD 4,207 ft., Arkadelphia 1,342 ft., Nacatoch 1,507 ft., Saratoga 1,882 ft., Tokio 2,558 ft., elevation 349 ft.

Nevada County: A. F. Weaver 1 Gurdon Lumber Co., NE SW NE 30-12s-20w, dry, TD 2,416 ft.

NORTH LOUISIANA WILDCAT FAILURE

Madison Parish: Marr Production Co. 1 McElwee, NW SE NW 6-15n-10e, dry, TD 6,021 ft., Tuscaloosa sand 5,027 ft., Massive sand 5,290-5,370 ft., Paluxy 5,370 ft., salt water sand 5,868 ft., elevation 84 ft.



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OKLAHOMA

Good Mississippi Lime Prospect in Noble County

DERBY OIL CO. 1 Wiegel, NE NE SE 2-21n-2w, Noble County, on drill-stem test in Mississippi lime at 4,833-57 ft. recovered gas in 4 minutes, estimated at 500,000 cu. ft. per day, 165 ft. of clean high-gravity oil, and 195 ft. of muddy oil, free of salt water. The well, which will be drilled to the Wilcox, is located midway between Polo pool about 2 miles to the northwest which produces from Bartlesville and the Northeast Sams to the southeast, which produces from Misener.

Peppers Refining Co. 1 Parks, SW NW 20-13n-2w, Oklahoma County, a west offset on 40-acre spacing to the Witcher gas-pool discovery well, gaged 1,700,000 cu. ft. gas per day from pay at 6,106-26 ft. in Bartlesville, and from 6,106-26 ft. in unconformity zone. Pipe is set on bottom at 6,225 ft. This is the third well in Witcher pool and the first to produce from both zones.

Ned Biffle et al 1 Pharaoh, NW NW NW 15-3n-2w, Garvin County, which is a new hole on the same location drilled in 1934 and completed as dry hole at 6,216 ft., recovered 120 ft. clean oil and 180 ft. water on drill-stem test at 5,570-80 ft. in Gibson sand. Pipe has been set on bottom at 5,627 ft. This test is about 2 miles northeast of the Southwest Antioch pool.

Ohio Oil Co. 2 Woods, NW SW NE 17-3n-5w, Grady County, the west offset to the deeper pay zone discovery on the west flank of the Knox pool, recovered 1,650 ft. water and 180 ft. mud on drill-stem test at 4,887-4,920 ft. and is being drilled deeper. The north offset to the Ohio deep zone discovery, T. H. McCasland 4 Carter-Woods, SE NW NE 17-3n-5w, is temporarily abandoned at total depth of 2,630 ft.

OKLAHOMA WILDCAT FAILURES

Atoka County: Donald T. Ingling 1 Stuber, C NW NE 15-3s-9e, dry, TD 3,025 ft., conglomerate 422 ft., Mayes 845 ft., Woodford 1,080 ft., Hunton 1,252 ft., Sylvan 1,283 ft., Viola 1,470 ft., Bromide dense 1,761 ft., tight sand 2,544-58 ft., sand 2,558-73 ft., lime 2,573-2,688 ft., Oil Creek 2,688 ft.

Cotton County: McMahan et al 1 Dar Ter, NW NW NW 10-5s-12w, dry, TD 1,903 ft., no tops reported.

Garvin County: Magnolia Petroleum Co. 1 Parker, SE NW 18-2n-1w, dry, TD 7,253 ft., Hunton 5,960 ft., Sylvan 6,306 ft., Viola 6,519 ft., Bromide dense 6,985 ft., sand 7,183 ft.

Roodhouse et al 1 J. T. Blanton, NE NE SW 34-4n-2e, dry, TD 3,090 ft., Belle City 2,625 ft., Bromide dense 2,945 ft., sand 3,030 ft.

Hughes County: Mid-Continent Petroleum 1 Frank Allen, NW NW NW 14-7n-10e,

dry, TD 3,812 ft., Senora lime 580 ft., Allen sand 970 ft., Hartshorne 2,685 ft., Gilcrease 2,920 ft., brown lime 2,320 ft., Upper Booch 2,411 ft., Lower Booch 2,519 ft. with a slight stain of oil, Wapanucka 3,423 ft., Union Valley 3,695 ft., first Cromwell 3,715 ft., second Cromwell 3,756 ft.

Donald T. Ingling 1 Wesley, NW NW NE 2-8n-10e, dry, TD 3,183 ft., Inola 1,645 ft., Bartlesville 1,658 ft., brown lime 2,000 ft., Booch 2,258 ft., Hartshorne 2,410 ft., Gilcrease 2,568 ft., Wapanucka 2,884 ft., Cromwell 2,160 ft.

Stephens County: Gulf Oil Corp. 1 L. C. Rue, NW SW NE 22-1s-4w, dry, TD 6,509 ft., Canyon 2,700 ft., Deese 4,050 ft., Dornick Hills 5,080 ft., sand 5,824-72 ft., 5,890-94 ft. and 5,966-6,,05 ft.

SOUTH LOUISIANA

Beauregard Parish Gets New Oil Pool

NEW ORLEANS.—Atlantic Refining Co. 1 Newport Industries, Inc., in 11-5s-12w, 2 miles northwest of West Pine Grove discovery, has opened Bivens oil pool in Beauregard Parish. Drilled to a total depth of 7,346 ft., with perforations at 7,272-78 ft., this well flowed a potential of 113 bbl. of oil per day through a 6/64-in. choke. Gas-oil ratio was 513 cu. ft., with tubing pressure of 1,040 psi., gravity 41°, and no water in the flow. Top of the Cockfield sand is 7,256 ft.

Crosby Drilling Corp. 1 Clifton Land Corp. et al, on the south flank of the Napoleonville dome, Assumption Parish, 45-12s-13e, tested gas and condensate on an initial test and has been shut in. Total depth is 5,413 ft., and pipe was perforated at 5,268-72 ft., where it flowed gas and condensate with 2,150 psi. on the tubing and 2,600 psi. on the casing.

The Texas Co. 3 United Lands Co., 1-10s-4e, deep wildcat test of the Sorrento dome, Ascension Parish, 2 miles northeast of production, is a dry hole, at total depth of 12,983 ft.

Texas Co. 1 Lafourche Basin Levee district, deep wildcat exploration in the Queen Bess Island area of Jefferson Parish, is continuing to core with a depth of 15,034 ft. Last logs were run to 14,322 ft. and 14,630 ft. with nothing favorable showing. A string of 8⅝-in. protection is cemented in the hole to 12,004 ft.

Stanolind Oil & Gas Co. 1 E. M. Watkins, wildcat test 6 miles east of Florence townsite in Vermilion Parish, 23-13s-1w, is reported drilling ahead below 12,100 ft. after running liner to a depth of 11,990 ft. Operators plan to test several shows already encountered.

SOUTH LOUISIANA SUCCESSFUL WILDCATS

Beauregard Parish: New Oil Pool Bivens—Atlantic Refining Co. 1 Newport Industries, Inc., 11-5s-12w, 2 mi. NW of West Pine Grove Discovery, TD 7,346 ft., perf. 7,272-78 ft., top sand 7,256-92 ft. (Cockfield), IP 113 bbl., 41.1°-gravity oil per day through 6/64-in. choke, gas-oil ratio 513 cu. ft., TP 1,040 psi.

SOUTH LOUISIANA WILDCAT FAILURES

Iberia Parish: Texas Co. 2 Fannie R. Kling, Fausse Point area, 28-11s-8e, dry, TD 13,122 ft.

Iberville Parish: Gulf Refining Co. 1-A A. M. Cotton et al, Bayou Boullion area, 49-9s-9e, 2 mi. SE of Bayou Boullion production, dry, TD 11,876 ft.

Lafayette Parish: S. W. Richardson 1 A. Brasseaux, North Cankton area, 68-8s-4e, 1¾ mi. south of Cankton field production, dry, TD 11,510 ft.

Plaquemines Parish: S. W. Richardson 1-A Delacroix Corp., 1-16s-13e, 4 mi. west of Delacroix field, dry, TD 11,791 ft.

APPALACHIAN FIELD

Chestnut Ridge to Be Tested Farther South

PITTSBURGH.—On Chestnut Ridge in Springhill Township, Fayette County, southwest Pennsylvania, Peoples Natural Gas Co. has made a location for a test on Allie May Martin farm 1 mile south of the Oriskany well completed on the W. M. Hartman farm which was shut in with a final gage of over 6,000,000 cu. ft. This extends the wildcatting, and because of the complexity of the structure, every well, even an inside location, is a wildcat.

In Green Township, Erie County, northwest Pennsylvania, Appalachian Development Co. is drilling through the Oriskany sand in the wildcat on E. M. Downing farm with the sand topped at 2,563 ft. and a showing of oil at 2,572 ft.

New locations in southwest Pennsylvania totaled seven, including one each in Bethel, Boggs, Kittanning, and Madison townships, Armstrong County; Springhill Township, Fayette County; South Franklin Township, Washington County.

In the Elk district, Kanawha County, West Virginia, Oriskany extension, United Fuel Gas Co. completed 5,851 J. H. Boggs with a final gage of 794,000 cu. ft. gas; elevation 917 ft.; Corniferous lime 5,149 ft.; Oriskany 5,270-5,313 ft.; shot 5,270-5,344 ft.; rock pressure 940 lb. 12 hours; total depth 5,347 ft. Here, W. E. Burchette et al are drilling through the Oriskany, topped at 5,018 ft. in the test Jesse Durham Heirs; Linden Drilling Co. in the test United Fuel Gas Co.'s tract with the Oriskany topped at 5,022 ft., and in Big Sandy dis-

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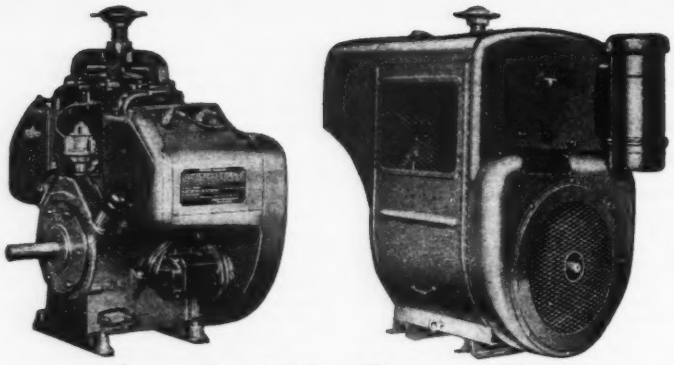

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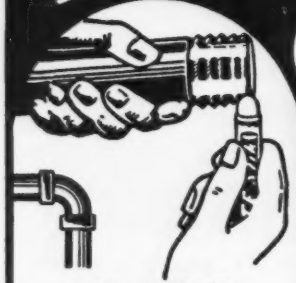

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trict, Falling Rock Producing Co. 2-A fee with the Oriskany topped at 5,183 ft.

In McKim district, Pleasants County, Dinsmoor & Co. completed 32 G. C. Roby good for 10 bbl. and 500,000 cu. ft. gas, Injun sand, total depth 1,875 ft.

New locations in West Virginia totaled 17. They are in Washington district, Boone County: Center district, Calhoun County; Pleasant district, Clay County; Grant district, Doddridge County; Ripley district, Jackson County; Elk district, Kanawha County; Union district, Marion County; Harvery district, Mingo County; Union district, Pleasants County; Burning Springs district, Wirt County.

CANADIAN FIELDS

Fourth Producer Is Seen in Leduc Field

CHATHAM.—In the Leduc field, southwest of Edmonton, Imperial-Leduc 4, LSD 16, 15-50-26w4, offsetting the discovery well to the east, is indicated a producer comparable with the three earlier wells. Drill-stem tests in the top 17 ft. of the second porous zone of the Devonian limestone at 5,335-52 ft. resulted in initial gas flow around 3,000,000 cu. ft. Six minutes later it was blowing mud and after 2 minutes oil began flowing, continuing 20 minutes until tester was closed. Production tests are continuing, with a good yield indicated. The new producer adds 1 mile to the previous 3¼ miles shown by the three previous wells, but no indication is available as to the length of the field, which trends northwest-southeast at right angle to the line of producers.

Recent production figures show Imperial-Leduc 1, with 3/16-in. choke producing 172 bbl.; Imperial 2, with ⅛-in., 117 bbl., and Imperial 3, with ½-in. choke, 119 bbl. All for 24-hour runs. Imperial-Leduc 5, LSD 8, 21-50-26w4, is below 3,638 ft.; Imperial-Leduc 6, LSD 1, 22-50-26w4, is waiting for rig. South of the main field, McColl-Frontenac 14-14, LSD 14, 14-48-27w4, is below 2,304 ft. Other companies have six locations, of which Globe-Leduc 2, LSD 9, 34-50-26w4, a close-in test, is spudding, and Okalta-Leduc 1, LSD 13, 7-50-25w4, 2½ miles east of production, is rigging.

Hanna.—Completion of Berry Creek Petroleums 1, LSD 3, 9-31-1w4, in the Hanna district of eastern Alberta, has been delayed by difficulty in securing casing. The well, standing at 4,286 ft., had a measured gas flow of 3,380,000 cu. ft. with naphtha recovery of 0.27 gal. per M.c.f., or 25 to 30 bbl. daily. The hole will be deepened to the Devonian, and a second Devonian test started.

Foremost.—In Foremost field, southern Alberta, McColl-Union 7c-34, LSD 7, 34-3-9w4, has finished at 2,202 ft. with 4,000,000 cu. ft. gas from the Bow Island sand McColl-Union 7C-1, LSD 7, 1-4-10w4, has been abandoned at 2,000 ft. McColl-Union 13-5, LSD 13, 5-6-7w4, is coring below 2,670 ft. McColl Union has new location in LSD 10, 19-2-7w4.

Lloydminster.—In the northwest extension of the Lloydminster field, West End 2, LSD 16, 10-50-2w4, finished at 2,003 ft. with 25 bbl. daily. Dalo 3, NE 9, 15-50-2w4, finished at 2,010 ft. and is testing with lower Cretaceous at 1,827 ft. and oil sand at 1,983 ft. Superior 5, LSD 5, 14-50-2w4, finished at 2,000 ft., is on pump, with production not announced.

In the Lloydsask area, Continental S. L. 2, NE 14, 29-46-26w3, finished at 1,902 ft. with lower Cretaceous at 1,580 ft. and oil sand at 1,753 ft., is testing. Humbolt 1, NE 12, 35-48-28w3, finished at 1,940 ft. with lower Cretaceous at 1,708 ft. and oil sand at 1,883 ft., is testing. Lloydminster Gas 13, NW 13, 24-49-28w3, finished at 1,882 ft. with lower Cretaceous at 1,622 ft. and producing horizon at 1,816 ft., looks like a gasser.

Looma.—Imperial Oil is below 1,500 ft on an important wildcat test, Imperial-Looma 1, LSD 4, 10-50-23w4, in a new area about 15 miles east of the Leduc field.

Jumping Pound.—In the Jumping Pound district in the Alberta foothills west of Calgary, Shell 5-7-1, LSD 5, 7-25-4w5, which got shows of wet gas and light crude in the Madison limestone contacted at 9,793 ft., is deepening below 10,060 ft. to test Devonian limestone, which is expected around 12,000 ft.

Mayerthorpe.—An exploratory test of a central foothills area where geological conditions similar to those in the Leduc field are thought possible has been started by Imperial Oil in the Mayerthorpe area, 70 miles northwest of Leduc. Imperial-Paddle River 1 has been spotted in LSD 5, 17-56-8w5, and rig is being moved from Leduc 3 to location.

SOUTHWEST TEXAS

New Shallow Pool For Webb County

CORPUS CHRISTI.—A new oil pool for Webb County, 5 miles southwest of Adami field, has been opened by M. L. Massingill & 56 Petroleum Co. 2-A George B. Parr (Watkins Ranch), in San Casimiro grant. Drilled to a total depth of 891 ft., this well pumped an initial production of 28 bbl. of oil per day through open hole at 878-891 ft. Top of the Mirando pay is 880 ft.

Cam field of Duval County has been extended 1 mile to the south by Southern Minerals Corp. 3 Juan Benavides, in El Mesquite Grant. Initial production was 26 bbl. net oil per day on gas lift, through perforations at 2,638-48 ft.

Continental Oil Co. 5-D Mrs. O. H. Davenport, wildcat test 1½ miles east of Rincon field production, in southeastern Starr County, is flowing 62 bbl. of oil and 18 bbl. of salt water per day through a ¼-in. choke, on new test through perforations at 4,363-73 ft. Tubing pressure is 120 psi., casing sealed. Well is still testing. Total depth is 5,000 ft., with 6-in. casing set on bottom.

Southern Minerals 1 M. O. McGloin, prospective gas-condensate discovery well in western San Patricio County, 2½ miles west-northwest of Edroy and 3½ miles east-northeast of San Patricio townsite, has run electrical log to the total depth of 6,340 ft., and set 5½-in. casing at 5,985 ft. to perforate for completion in the gas-condensate sand logged at 5,952-72 ft. On a 6-minute drill-stem test at 5,954-57 ft., recovery was 5 gal. of condensate, with 400 psi. working pressure, bottom-hole pressure 2,400 psi. open and 2,650 psi. closed. Similar pressures were recorded in test at 5,957-62 ft., open 5½ minutes, with 20 ft. condensate recovered; and at 5,962-67 ft. where 7 ft. of condensate was recovered in 7½ minutes; and at 5,967-72 ft., where test open 3½ minutes recovered 10 ft. of condensate.

H. R. Smith & W. C. McBride, Inc., 1 W. H. Kaiser, wildcat test in southwestern Nueces County, approximately 2 miles northwest of Bishop, ran drill-stem test at 7,132-36 ft., and developed 260 psi. working pressure in 15 minutes; the well kicked an estimated 6,500 ft. of oil into the drill pipe, but the tool actually recovered 1,400 ft. of oil. The 5½-in. casing has been set on bottom at total depth of 7,136 ft. for the completion attempt.

SOUTHWEST TEXAS SUCCESSFUL WILDCATS

Duval County: Extension to Cam field—Southern Minerals 3 Juan Benavides, 1 mi. S of Cam field, in El Mesquite Grant, top pay 2,638 ft., TD 2,666 ft., perf. 2,638-48 ft., IP 26 bbl. net oil per day on gas lift, 40 per cent water.

Webb County: New Oil Pool, Watkins, M. L. Massingill & 56 Petroleum Co., 2-A Geo. B. Parr (Watkins Ranch), San Casimiro

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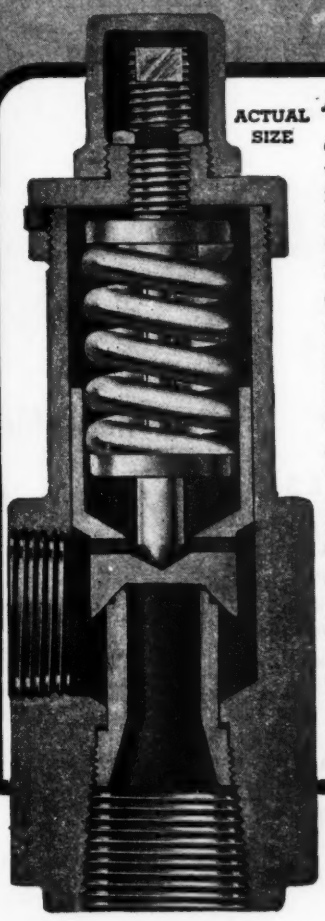

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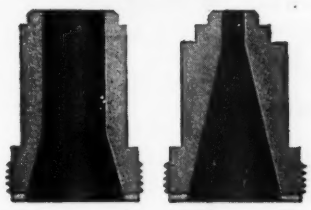

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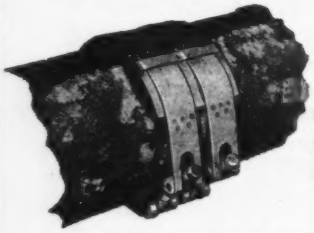

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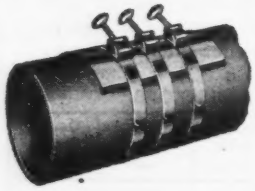

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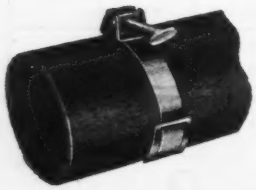

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Grant, 5 mi. SW of Adami field, TD 891 ft., open hole 878-91 ft., top pay (Mirando) 880 ft., IP 28 bbl. oil per day on pump, no gas, no water.

SOUTHWEST TEXAS WILDCAT FAILURES

Duval County: Edwin B. Cox & Jake L. Hamon 1 James R. Dougherty, BS&F Sur., 193, 14 mi. SSW of Freer, dry, TD 3,300 ft.

Duval County: Government Wells Oil Co., Inc., 1 R. Lopez est., Dinn area, Rufino Lopez Sur. 6, 9 mi. NE of Bruni, dry, TD 2,552 ft.

Guadalupe County: Lupe Oil Co. 1 L. Banks Est., in Robert Smith Sur., 4 mi. NE of Kingsbury, dry, TD 1,922 ft.

Jim Hogg County: Gulf-South Oil Corp. 1 E. L. Armstrong, Sam Honey survey 296, 12 mi. SW of Hebbronville, dry, TD 3,264 ft.

Starr County: Zimmerman & Conner 1 W. B. Osborn, in I Gonzales survey 522, 20 mi. NE of Rio Grande City, dry, TD 4,605 ft.

Webb County: Republic Natural Gas Co. 1 Rosa V. de Benavides, in Josefa Cuellar Grant, 1 mi. N of Bruni, dry, TD 3,515 ft.

TEXAS GULF COAST

New Hackberry Pool For Orange County

HOUSTON.—Sun Oil Co. has opened a new Hackberry sand pool for Orange County. The new strike, 2 Lutcher-Moore Lumber Co., in James Duson Survey, approximately 1 mile northwest of production in Orange field. On potential test it flowed 178.53 bbl. of 34.1°-gravity oil through a 10/64-in. choke. Flowing pressure on tubing was 750 psi., and gas-oil ratio 706 cu. ft. Production is through perforations at 7,589-7,601 ft.; total depth 9,005 ft.; top of Hackberry at 7,590 ft.

A new sand production on the north flank of the West Columbia dome in Brazoria County has been opened by The Texas Co. 27 J. G. Phillips et al, located in the George Tennille Survey. On potential gage it flowed 766 bbl. of 30.8-gravity oil daily through a ¼-in. choke, with flowing pressure on the tubing 950 psi. and gas-oil ratio 275 cu. ft. Total depth is 7,530 ft., with 7-in. casing cemented to 7,445 ft., and perforated at 6,633-40 ft. for completion. Top of the producing horizon is 6,587 ft.

Ryan Consolidated Petroleum Corp. 1 T. H. Wagner, discovery well in the Green Lake area of Calhoun County, which had swabbed an estimated 56 bbl. of 40.6°-gravity oil per day through perforations at 5,980-6,008 ft., and is waiting on pump for final completion, was opened after having been shut in for a week and began flowing at the rate of 36 bbl. per day through a ⅛-in. choke, and may make a flowing oil well. Operators are now waiting on potential gage. Top of pay 6,977 ft., tubing pressure 450 psi., casing sealed. This well is located in Manuel Lopez grant, Abstract 25, 2 miles northeast of Green Lake townsite.

Gasoline Production Corp. and Sunray Oil Corp. 1-A H. E. Yoward, second producer at the new Yoward field of Bee County, flowed 171 bbl. of 41.6°-gravity clean oil per day through a 5/32-in. choke, with gas-oil ratio 1,060 cu. ft., tubing pressure 910 psi., casing pressure 1,950 psi. Total depth is 7,558 ft., with top of pay at 7,520 ft., and producing through perforations at 7,528-40 ft.

TEXAS GULF COAST SUCCESSFUL WILDCATS

Brazoria County: New oil sand, West Columbia—The Texas Co. 27 J. G. Phillips et al, in Geo. Tennille Lge., TD 7,530 ft., perf. 6,633-40 ft., IP 766 bbl. oil per day through a ¼-in. choke, gas-oil ratio 275, TP 950 psi., gravity 30.8°, 0.1 per cent water, top sand 6,587 ft.

Goliad County: New gas pay, Sarco Creek—Ginther, Warren & Ginther 1-B Carrie Wood, in John Shearn Subd. (rework job, old A. H. and C. L. Rowan 1-B Wood, orig. R. B. Swiger 1-B Wood discovery well), first completed as oil producer from open hole 5,008-48 ft. in Vicksburg; later recompleted as gas well through perf. at 4,125-50 ft., and now completed in pay topped at 2,870 ft., TD 5,048 ft., perf. 2,870-80 ft., IP 11,500,000 cu. ft. gas per day (dry gas) on open flow, shut in pressure 1,250 psi., no water.

Jefferson County: New gas-condensate pay, North Cheek—Floyd L. Karsten 6 J. H. Phelan, in Samuel Stivers Sur., TD 8,341 ft., perf. 8,180-90 ft., IP 4,030,000 cu. ft. gas per day and 90 bbl. condensate per day through a ¼-in. choke, tubing pressure 2,702 psi., casing pressure 2,881 psi., shut-in pressure 2,907 psi., gravity 52°, no water.

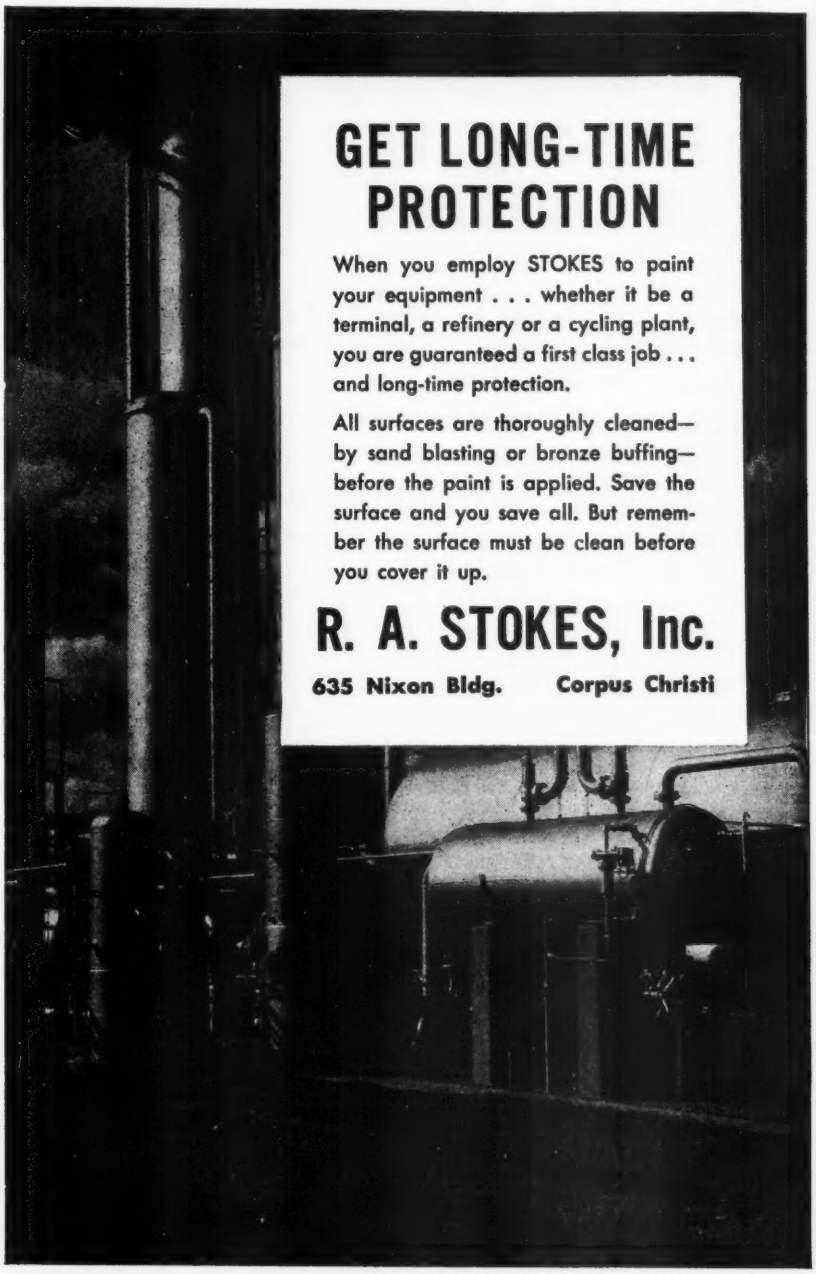
Live Oak County: New gas-condensate pool, Harris—Stanolind Oil & Gas Co. 1 Pearl Harris, in Francisco Leal Sur., 2 mi. NE of Geo. West, top pay 7,350 ft. (Slick sand), TD 10,020 ft., perf. 7,370-80 ft., IP 7,000,000 cu. ft. gas per day on open flow, with some condensate, shut-in pressure 2,865 psi., no water.

Orange County: New oil discovery, Orange dome, Northwest Flank—Sun Oil Co. 2 Lutcher-Moore Lbr. Co., Jas. Dyson Lge., 3,100 ft. west of Orange dome nearest production, TD 9,005 ft., top sand 7,590 ft. (Hackberry), perf. 7,589-7,601 ft., IP 178 bbl. oil per day through a 10/64-in. choke, gas-oil ratio 706 cu. ft., TP 750 psi., gravity 34°, no water.

TEXAS GULF COAST WILDCAT FAILURES

Fayette County: Gulfshore Oil Co. et al 1 F. A. Kremel et al, Samuel Millet Lge., 1½ mi. N of Cistern field, dry, TD 1,948 ft.

Orange County: Texana Pet. and Kirby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All surfaces are thoroughly cleaned—by sand blasting or bronze buffing—before the paint is applied. Save the surface and you save all. But remember the surface must be clean before you cover it up.
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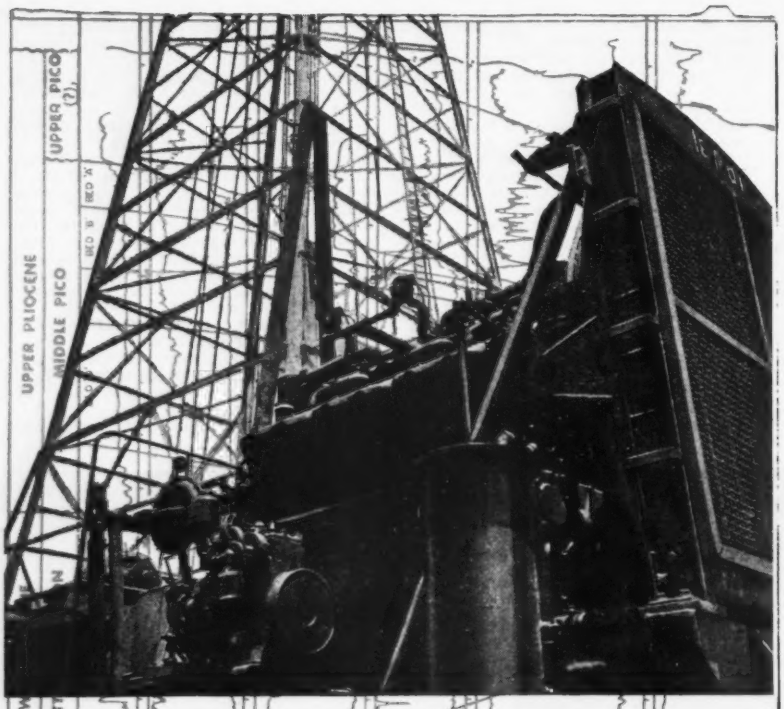
635 Nixon Bldg. Corpus Christi



Geology plays tricks

. . . but you can always count on LE ROI reserve power, acceleration, and dependability to make hole faster with larger profits for you

Formations vary, giving drillers a bad time, but Le Roi performance is always dependable. First of all, Le Roi engines are conservatively rated — there's a lot of reserve power in every unit, put there to help your crew out of tight spots. Moreover, every part in the engine is designed to handle all this extra power with ease. That is why Le Roi engines keep on lugging.

Round-trip time is reduced because of the rapid acceleration engineered into each Le Roi engine. Le Roi's jump like jackrabbits when you give them the gun — you get back to drilling in a hurry, make hole faster and at greater profit.

See your nearby Le Roi distributor. He can show you the Le Roi engine best suited to your job. Horsepower sizes range from 4 to 400, and they operate on natural gas or butane, as well as gasoline. Let him show you, detail by detail, why so many oilfield men standardize on Le Roi engines. Write for latest, fact-filled bulletins.

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Lloyd, Smith Company — Bradford, Penn.
P. C. McKenzie Co. — Pittsburgh

Canada
Drilling Supplies, Ltd. — Calgary, Alberta

Complete Sales and Service Facilities

P-90

Pet. 1 Horace Peveto, N. Vidor area, in Edward Hurst Sur., dry, TD 8,012 ft.

Wharton County: Jack W. Frazier and O. J. McCullough 1 Hawes Est., in J. J. Dillard Sur., 3 mi. SW of Louise townsite, dry, TD 6,503 ft.

Magnolia Pet. Co. 1-A Linderholm, in A. Edwards 1/3 Lge., 1¼ mi. S of Chesterville field production, dry, TD 9,863 ft.

ROCKY MOUNTAIN

All Rocky Mountain Rotary Rigs in Use

DENVER.—With more than 100 new wells spudded in May, practically every rotary rig in the Rocky Mountain area is actively employed, and most of the contractors have backlogs of bid invitations. This drilling campaign, which extends from northern New Mexico to the Canadian border, is not only one of the most aggressive ever staged in the region, but differs from others in the past in several ways. The majority of the drilling wells are outposts and wildcats. Major companies are leading in this exploratory work. Instead of wells of 3,000 to 4,000 ft., many are going to depths from 8,000 to 13,000 ft., and surface structures are now secondary to hidden domes. For these reasons, the present campaign marks a new era in the search for oil in the area.

The present activity marks the culmination of leasing activities of the past 3 or 4 years. A year ago it was estimated that 15,000,000 acres were under lease in the area. Nearly half of these holdings were in Wyoming, with the remainder in Colorado, Utah, and Montana. These leases now have been geologized and the most promising checked, unitized, and made ready for testing. Actual drilling of prospects is getting under way. Leasing, however, has not ceased, and many other areas are now being sifted and will be ready for drilling later on. Some of the most important wildcats to be drilled this year have completed the preliminary work and are waiting on rigs.

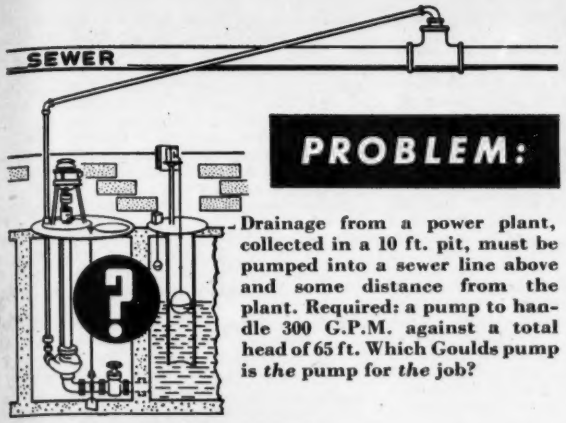
While all rotaries are employed at present, contractors do not see any need for rushing additional rigs into the territory Practically all new operations are drilling under appropriations for the second quarter, and most of the contracts are for single wells. There is little likelihood, however, that the major exploratory campaign now under way will be abated to any extent during the next 2 years.

Western Colorado wildcat.—General Petroleum Corp. has revived its location for a 7,500-ft. test to the Weber sand in its 1 Government, C NE SW 24-2s-103w, West Douglas Creek, Rio Blanco County, Colorado, which was suspended 2 years ago when it was unable to develop a satisfactory water supply. A water supply has been developed in wells 5 miles to the north and will be piped to the location, 18 miles south of Rangely field.

North of Douglas Creek, and northeast of West Douglas Creek, running up to within a few miles of Rangely field, The Texas Co. is completing unification and plans for drilling on a 54,000-acre block in North Douglas Creek. General Petroleum also is expected to move into Piceance Creek soon to drill three or four wells to the shallow gas sand at around 3,000 ft., where it has developed gas in four wells in the Green River formation.

Poose Creek resumed.—Phillips Petroleum Co. has resumed operations on its 1 Government, SE NW SE 10-2n-88w, Poose Creek, Rio Blanco County, Colorado, after being shut down for the winter at 6,510 ft. It had the Weber at 2,044 ft., and is to be an 8,300-ft. test to the Devonian.

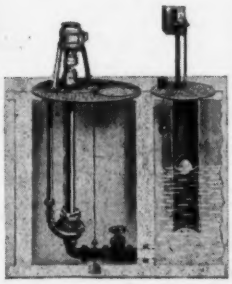
Olathe test.—R. E. Wear 1 fee, SW SW SW 27-50n-10w, Olathe district, Montrose County, Colorado, which was reported shut down for orders at 1,673 ft., in granite,



PROBLEM:

Drainage from a power plant, collected in a 10 ft. pit, must be pumped into a sewer line above and some distance from the plant. Required: a pump to handle 300 G.P.M. against a total head of 65 ft. Which Goulds pump is *the* pump for *the* job?

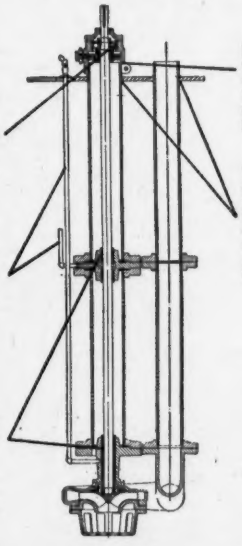
SOLUTION:



Goulds Fig. 3047 F, arranged for a 10 ft. pit, is designed especially for this type of application. The pit cover is made to fit the particular pit, the pump casing, discharge pipe, support column, cover plate, motor bracket and motor being one rigid unit ready to set into pit. The pump is automatically operated by a guided float in the pit connected to a float switch above the pit cover.

Goulds vertical pumps are made in 12 types and sizes to handle from 10 to 800 G.P.M. with heads up to 130 ft. When you have a pumping problem, call Pump Headquarters or your nearest Goulds office.

Why Goulds Sump Pumps are so satisfactory



Radial and thrust bearing — heavy duty, oil lubricated, is enclosed in an oil and dust sealed housing. Provides adequate support for pump rotating element.

Separate grease pipe leads to lower bushing and steady bearing bushings are fed through Alemite fittings above cover plate. Pump is therefore satisfactory for wet or dry pits.

Steady bearings — used so bearing span is never more than 5 ft. Lower bushing and steady bearing bushings are of non-seizing, non-scoring bronze.

Bearing housing — threaded to pipe column. This permits above-the-pit adjustment of impeller clearances.

Pipe column and discharge pipe are welded to cover plate, creating a rigid unit and insuring permanent alignment of pump and bearings.

GOULDS PUMPS, INC.
SENECA FALLS, N. Y.
the PUMP FOR the JOB

THRIFTY PIPE THAT HOLDS DOWN MAINTENANCE COST

The direct and indirect expense of frequent replacements of short-lived refinery pipe lines can be reduced, or avoided altogether, by the use of cast iron pipe. This has been proved by many refineries whose maintenance costs have been lowered after replacing other pipe materials with cast iron. Cast iron pipe has native high resistance to both interior and exterior corrosion. Measured by full period of service, it is cheapest in the end. Available in bell-and-spigot, plain end or flanged types, or with standardized mechanical joints.

Cast Iron Pipe Research Association, Thomas F. Wolfe, Research Engineer, 1015 Peoples Gas Bldg., Chicago 3, Illinois

was deepened to 1,725 ft., after going through approximately 50 ft. of quartzite and back into sand. It had a hole full of water beneath the hard rock.

Frontier test at Worland.—Pure Oil Co. 5 Unit, C SW NW 21-48n-92w, Worland Dome, Washakie County, Wyoming, flowed 110 bbl. of 60°-gravity crude and 4,500,000 cu. ft. of gas from second Frontier, top at 7,247 ft., preliminary to testing the third Frontier.

North Elk Basin.—Sinclair-Wyoming Oil Co. 1 Wilkins, NW SW NW 28-9s-23e, North Elk Basin, Carbon County, Montana, is coring below 4,902 ft. after testing Dakota and Lakota sands through drill pipe. At 4,389-4,425 ft., gas came to the top in 2 minutes and at the end of 55 minutes gaged 2,740,000 cu. ft. per day through ½-in. choke. Test of Lakota at 4,38-87 ft., through ¼-in. choke, gas to the top in 1 minute, and at the end of 45 minutes was making 3,500,000 cu. ft. Previous tests had showed oil and gas in the Frontier. It is headed for the Tensleep.

New operations.—Thirteen new operations were reported, of which 3 were in the Rangely field, and General Petroleum's West Douglas Creek location in Colorado; 1 each in Mush Creek, Beaver Creek, and Gebo, and 2 wildcats in Wyoming; 2 in Kevin-Sunburst and 1 each in Bowdoin and Cut Bank, in Montana. One of the Wyoming wildcats is General Petroleum Corp. 45-26-Government, NE NE SW 26-46n-91w, South Sand Creek, Washakie County, Wyoming. This location is in Big Horn Basin, 4½ miles east of General Petroleum's recent discovery on the South Dome, and 11 miles northeast of the recent Neiber Dome discovery. It will go below 10,000 ft. The other wildcat is Superior Oil Co. 1 Unit, SW NE SW 27-27n-103w, Pacific Creek structure, Sublette County, on the northeast side of the Green River basin, a 12,000-ft. test of Cretaceous beds on a unitized block of 36,981 acres.

COLORADO SUCCESSFUL WILDCAT

DeBeque, Mesa County: Earl A. Ottman 1 Roberts, C SW SE 21-8s-97w, TD 585 ft., est. 2,500,000 cu. ft. gas in middle Wasatch, Tertiary age.

WYOMING WILDCAT FAILURES

Schmidt, Albany County: Front Range

(Continued on page 175)

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that sealed bids will be received until 1 p.m. Eastern Daylight Saving time, Wednesday, June 25, 1947, for land described herein situated within the known geologic structure of the La Barge field, 6th P.M., Wyoming. This land is offered to qualified bidders of the highest cash amounts per acre as a bonus for the privilege of leasing the land under section 17 of the leasing act of February 25, 1920 (41 Stat. 437, 30 U.S.C. sec. 181), as amended, in the following parcels, all in T. 27 N., R. 113 W.: Parcel No. 1, sec. 22, SW¼SW¼, 40 acres, Parcel No. 2, sec. 27, NW¼SE¼, 40 acres. Total 80 acres. Bids must be submitted on each parcel separately but if both parcels are awarded to the same bidder, they may be included in a single lease. Royalties payable to the United States will be at the rate of 12½ per cent to 25 per cent for oil and 12½ per cent to 16 2/3 per cent for gas in accordance with Schedule B in the lease form. All bids must be submitted to the Director, Bureau of Land Management, Washington 25, D. C., and each bidder must submit with the bid one-fifth of the amount bid in cash or by certified check on a solvent bank, or by money order, made payable to the order of the Treasurer of the United States, and file the showing of qualifications to receive a lease, required under 43 CFR 192.42(b) and (c). The envelopes should be plainly marked, "Bid for Parcel No. , La Barge field, Wyoming. Not to be opened before 1 p.m. Eastern Daylight Saving time, Wednesday, June 25, 1947." No bids received after the hour fixed herein for receiving bids will be considered. The remainder of the bonus and the annual rental at the rate of $1 per acre must be paid and a corporate surety bond in the sum of $1,000 must be furnished by a successful bidder prior to the issuance of a lease. A $5,000 corporate surety bond will be required prior to commencing drilling operations on the land. The deposits of the other bidders will be returned upon acceptance of the successful bids. Bidders are warned against violation of section 59, U. S. Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids. Fred W. Johnson, Director.

DE LUXE AIRPLANE FOR SALE $50,000

This 5-passenger twin engine Beechcraft D18S is in factory-new condition; always operated in *private* service; low time with one spare new P&W Wasp. Top speed, 220 mph; cruise, 200 mph; over 1,000-mile range. Tan and light green Bedford upholstery with bleached walnut trim; card tables; thermos cabinets; toilet. Hydraulic reclining chairs. Fully soundproofed.

Bendix auto. direc. finder; auto. pilot; anti-icers; de-icers; two transmitters; Lear receiver; auto. beacon rec.; dual flight instruments. This plane is for sale because owner has purchased larger ship. It is the finest aircraft available at $50,000. For information or inspection contact Lloyd McBride, 310 S. Michigan Ave., Chicago, Ill.

ILLINOIS

McClosky Well Flows 92 Bbl. Per Hour

MATTOON.—Central Pipe Line Co. et al 1 Harrel-Hunley, NW NE NW 35-4n-9e, Richland County, flowed 551 bbl. oil in 6 hours, natural, from McClosky lime logged at 2,926-38 ft. Total depth is 2,935 ft. This is a new pay for this immediate area in the Noble pool.

Heldt Drilling Co. et al 1 Hill-Endicott, NW SW NE 28-3s-10e, White County, is completed as 120-bbl. pumped in Benoist at 2,990-3,005 ft. Well was drilled to 3,142 ft. and plugged back to 3,010. Renault was logged at 3,064 ft.

Fleming-Swann et al 1 Mason, SE SE SE 10-4s-7e, Hamilton County, is coring Aux Vases at 3,220 ft.

ILLINOIS WILDCAT FAILURES

Brown County: S. M. Levine 1 Koch, SW SW SW 4-1n-3w, dry at 835 ft., Devonian 578 ft., Golconda 786 ft.

Clark County: J. D. Wilhoit 1 Hammond, NE SW NE 18-11n-13w, dry 761 ft., Ste. Genevieve 745 ft.

Edgar County: Livingood 2 Landes, SW SW 10-3n-13w, dry at 536 ft., Pennsylvania sand 493 ft.

Edwards County: Calvert & Willis 1 Bennett Heirs, SE SE SE 29-1n-10e, dry, at 3,407 ft., Glen Dean 2,663 ft., Aux Vases 3,209 ft., McClosky 3,367 ft., St. Louis 3,403 ft.

S. D. Jarvis 1 Wade, NW NE SE 11-1s-10e, dry at 2,649 ft., Menard 2,468 ft., Waltersburg 2,556 ft., Tar Springs 2,610 ft.

Fayette County: R. S. Hayes 1 Reynolds, SE SE SE 10-5n-4e, dry at 2,583 ft., Glen Dean 1,981 ft., Barlow 2,119 ft., Ste. Genevieve 2,366 ft., McClosky 2,491 ft., St. Louis 2,575 ft.

Gallatin County: Ashland Oil & Refining Co. 1 Friends, SE NE SW 12-8s-8e, dry at 2,999 ft., Menard 2,028 ft., Viola 2,127 ft., Cypress 2,543 ft., Ste. Genevieve 2,832 ft.

Jasper County: A. J. Slagter 1 Hoffman, SE SW NW 12-5n-10e, dry at 2,983 ft., Glen Dean 2,345 ft., Cypress 2,520 ft., Aux Vases 2,794 ft., McClosky 2,902 ft.

Marion County: Lutrell et al 1 Krug, SW SW NE 1-4n-3e, dry at 2,405 ft., Glen Dean 1,787 ft., Cypress 1,971 ft., Aux Vases 2,194 ft., McClosky 2,310 ft.

Montgomery County: Joe Reznik 1 Monke, NE NE SE 4-7n-5w, dry at 2,600 ft., Devonian 1,789 ft., Trenton 2,490 ft.

Saline County: C. E. Blehm 1 Spencer, SE NW SE 12-9s-7e, dry at 2,762 ft., Glen Dean 1,979 ft., Benoist 2,223 ft., Ste. Genevieve 2,603 ft.

Shelby County: John Carlson 1 Mautz, SW SE NE 31-12n-2e, dry at 1,651 ft., Glen Dean 1,262 ft., Cypress 1,468 ft., Ste. Genevieve 1,598 ft., McClosky 1,627 ft.

Wabash County: George Engle 1 Whitesides, SE SW SW 8-1n-11w, dry at 2,209 ft., Glen Dean 1,698 ft., Barlow 1,866 ft., Ste. Genevieve 2,125 ft., McClosky 2,183 ft.

Wayne County: A. J. Slagter 1 Borah, SE SW SE 9-1s-9e, dry 3,466 ft., Tar Springs 2,700 ft., Glen Dean 2,724 ft., Cypress 2,480 ft., Aux Vases 3,274 ft., McClosky 3,392 ft.

Carter Oil Co. 1 Churchwell, SE SE SW 16-3s-8e, dry at 3,556 ft., Rosiclare 3,430 ft., McClosky 3,486 ft.

ILLINOIS SUCCESSFUL WILDCATS

Edwards County: Magnolia Petroleum Co. 1 Wilson, NE NE SW 18-1s-10e, IP 4 bbl. from McClosky at 3,313-22 ft., TD 3,392 ft., PB 3,363 ft., Aux Vases 3,345 ft., McClosky 3,313 ft.

Effingham County: Superior Oil Co. 1 Kluthe, NE SW SE 10-6n-7e, IP 54 bbl., Cypress sand 2,534-39 ft., TD 2,887 ft., Cypress 2,533-40 ft., Rosiclare 2,850 ft., McClosky 2,881 ft.

Franklin County: M. H. Richardson 1 Franklin County Coal Corp., NE NE NE 14-5s-2e, IP 11 bbl. from Aux Vases, 2,710-25 ft., Rosiclare 2,779 ft., TD 2,788 ft., new pay.

White County: Joe Reznik 1 Grant, SW SW SE 13-7s-9e, IP 250 bbl., Waltersburg sand 2,291-99 ft., TD 2,299 ft., Menard 2,246 ft.

Heldt Drilling Co. 1 Hill-Endicott, NW SW NE 28-3s-10e, IP 120 bbl. in Benoist 2,990-3,005 ft., TD 3,142 ft., PB 3,010 ft., Glen Dean 2,629 ft., Renault 3,064 ft.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that sealed bids will be received until 1 p.m., Eastern Daylight Saving Time, Wednesday, July 9, 1947, for hand described herein situated within the known geologic structure of the Kevin-Sunburst field, P.M., Montana. This land is offered to qualified bidders of the highest cash amounts per acre as a bonus for the privilege of leasing the land under section 17 of the leasing act of February 25, 1920 (41 Stat. 437, 30 U.S.C. sec. 181), as amended, in the following parcels: Parcel No. 1, T. 34 N., R. 2 W., sec. 3, lot 4, SW¼ NW¼, NW¼SW¼, 120.12 acres. Parcel No. 2, T. 35 N., R. 2 W., sec. 19, SE¼SW¼, 40 acres. Parcel No. 3, T. 34 N., R. 3 W., sec. 1, E½SE¼, 80 acres. Total 240.12 acres. Bids must be submitted on each parcel separately, but if two or more parcels are awarded to the same bidder they may be included in a single lease. Royalties payable to the United States will be at the rate of 12½ per cent to 25 per cent for oil and 12½ per cent to 16 2/3 per cent for gas in accordance with Schedule B in the lease form. All bids must be submitted to the Director, Bureau of Land Management, Washington 25, D. C., and each bidder must submit with the bid one-fifth of the amount bid in cash or by certified check on a solvent bank, or by money order made payable to the order of the Treasurer of the United States, and file the showing of qualifications to receive a lease, required under 43 CFR 192.42(b) and (c). The envelopes should be plainly marked, "Bid for Parcel No. , Kevin-Sunburst field, Montana. Not to be opened before 1 p.m., Eastern Daylight Saving Time, Wednesday, July 9, 1947." No bids received after the hour fixed herein for receiving bids will be considered. The remainder of the bonus and the annual rental at the rate of $1 per acre must be paid and a corporate surety bond in the sum of $1,000 must be furnished by a successful bidder prior to the issuance of a lease. A $5,000 corporate surety bond will be required prior to commencing drilling operations on the land. The deposits of the other bidders will be returned upon acceptance of the successful bids. Bidders are warned against violation of section 59, U. S. Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids. Fred W. Johnson, Director.

OHIO, KENTUCKY

Carlisle Township Gas Extended Northeast

COLUMBUS.—Glenn Harmon et al moved northeast in an endeavor to extend their new gas pool in Carlisle Township, Lorain County. The well located on Anna Polen, Sec. 3, found the upper Clinton at 2,274-76 ft. with 10,000 cu. ft. gas and the lower sand at 2,300-18 ft. with 870,000 cu. ft. gas natural. After shot the well caught fire and the tools were lost, but they were successful in tubing on top of the tools. The gage when shut in was 1,750,000 cu. ft., and the rock pressure was 1,130 psi.

The Ohio Fuel 1 Muskingum W. C. District, Section 23, Mifflin Township, Ashland County, found 17 ft. of good sand at 2,404-21 ft. with a natural gage of 1,690,000 cu. ft. The well is on an inside location and is expected to finish the present drilling in the pool.

The National Oil & Gas moved to the south end of the H. H. Bankes farm in Section 20 for the second offset to its oil discovery in Deerfield Township, Morgan County. Clinton sand from 4,114-55 ft. had a small showing of gas and 2,500 ft. of oil in the hole, 24 hours after drilling in. After shot the well made 117 bbl. the first day. This area now looks good and will have a number of additional wells drilled this year. In the northeast part of the township, the St. Peter sand will be tested by a well now being drilled by Samuel J. Brendel Oil & Gas, Inc. The well is located on Maynard Barnes in Section 12.

OHIO WILDCAT FAILURES

Meigs County, Chester Township: H. B. Piersol et al 1 Wm. A. Will, Sec. 6, Berea 1,676-95 ft., dry, TD 1,755 ft.

Lebanon Township: W. I. Gettman 2 G. W. Hobach, Sec. 17, Oriskany 4,149-50 ft., dry, TD 4,172 ft.

Muskingum County, Rich Hill Township: Wasson Co. 1-M W. T. Osborne, Sec. 7, Medina 4,425-30 ft., dry, TD 4,439 ft.

Salt Creek Township: National Oil & Gas Corp. 1 Mary J. Wickham, Sec. 10, St. Peter 6,617-6,720 ft., dry, TD 6,910 ft.

WESTERN KENTUCKY

OWENSBORO.—C. E. O'Neal & Co. et al 1 Booker T. Fellows, 16-O-23, Henderson County, swabbed 10 bbl. oil per hour after marble shot in Waltersburg sand at 1,741-49 ft. Total depth is in Waltersburg sand at 1,749 ft. The well, which is about ¾ mile northeast of the Dixie pool, is being put on the pump to test.

F. J. Fleming et al 1 L. B. Melton, 7-N-23, Webster County, on drill-stem test in Tar Springs at 1,931-58 ft. recovered 75 ft. of clean oil, 90 ft. of oil-cut mud, and no water. Good saturation was logged at 1,951-58 ft. Pipe has been set at 1,931 ft. This test is about 1¼ miles southwest of the Poole pool.

Delta Drilling Co. et al 1 Arnett, 4-N-23, Henderson County, swabbed 500 bbl. oil per day, natural, from 1,782-1,810 ft. in the Waltersburg sand. This is the best well completed to date in the Tunnell Hill pool.

EASTERN KENTUCKY

ASHLAND.—Two wells were being tested for gas in the eastern Kentucky field of operations, and several new locations were noted.

Kentucky-West Virginia Gas Co. was testing in Well No. 834, L. D. Parks property, Knott County, at 3,253 ft., and Well No. 856, Sallie Howard property, Magoffin County, 1,417 ft.

New locations were Kentucky-West Virginia Gas Co. Wells No. 5,746, M. B. Goble, Martin County; 5,747, B. F. Gilliam, Pike; 5,748, W. J. Slone, Knott; 5,749, Wilson Damron, Pike, and 5,750, George H. Ray, Pike.

INDIANA

EVANSVILLE.—Ralph Halbert et al 1 Asher Colliers, SW SE SW 30-2s-7w, Pike County, on drill-stem test at 1,403-09 ft. in McClosky lime, recovered gas in 6 minutes and flowed clean oil in 14 minutes. Total depth is 1,409 ft. Pipe is being set to test. This test is about 2 miles southeast of the Oakland City pool.

C. A. Lynch 1 Fleener, NW SE SW 22-3s-12w, Gibson County, is completed in Waltersburg at 1,872-80 ft. with initial production of 250 bbl. oil per day, natural. Total depth is 1,280 ft.

INDIANA WILDCAT FAILURE

Gibson County: Olds Oil Co. 1 Yochum, NW SW SE 20-2s-10w, dry at 2,113 ft., Glen Dean 1,538 ft., Barlow 1,772 ft., Cypress 1,787 ft.

INDIANA SUCCESSFUL WILDCAT

Gibson County: C. A. Lynch 1 Fleener, NW SE SW 22-3s-12w, IP 250 bbl. in Waltersburg 1,872-80 ft., TD 1,880 ft.

CALIFORNIA

Goleta Area May Have New Discovery

LOS ANGELES.—Honolulu Oil Co. has a prospective new discovery in the Goleta area of Santa Barbara County at their 309-1 State, 19-4n-28w, 4 miles north of the Elwood field. Now under control after blowing wild for nearly 36 hours, the well is bottomed in what is believed to be the Vaqueros oil sand. Only gas and salt water were recovered during the blowout period, and the oil potentialities are still unknown. Operators, however, are now circulating with mud and conditioning the hole preparatory to drilling ahead. Total depth is 3,692 ft. The 309-1 State is a directionally drilled well and is bottomed offshore in the tidelands area.

Western Gulf Oil Co. has spudded in its second well in the new Arvin Schist field of Kern County, and is now drilling ahead below 1,010 ft. The new well is known as the 2 Di Giorgio, and it is located in 10-31s-29e. This location is up structure from the discovery well, the 1 Di Giorgio, a 100-bbl. pumper at approximately 6,400 ft.

Redrilling has now reached a depth of 7,945 ft. at the Standard Oil Co. 73-30-V, 30-23s-19e, deep zone discovery in the Ketteleman Hills Middle Dome area of Kings County. This well originally went to a total depth of 12,389 ft. in the Eocene where it showed every indication of making a good discovery. True productive potentialities were never determined, however, due to stuck drill pipe in the bottom of the hole.

New locations announced during the past week totaled 38, a decrease of 5 from the total for the previous week. Work was fairly evenly distributed with the Lost Hills field receiving the greatest number of new tests with a total of four. Paloma and Wilmington followed closely with three each.

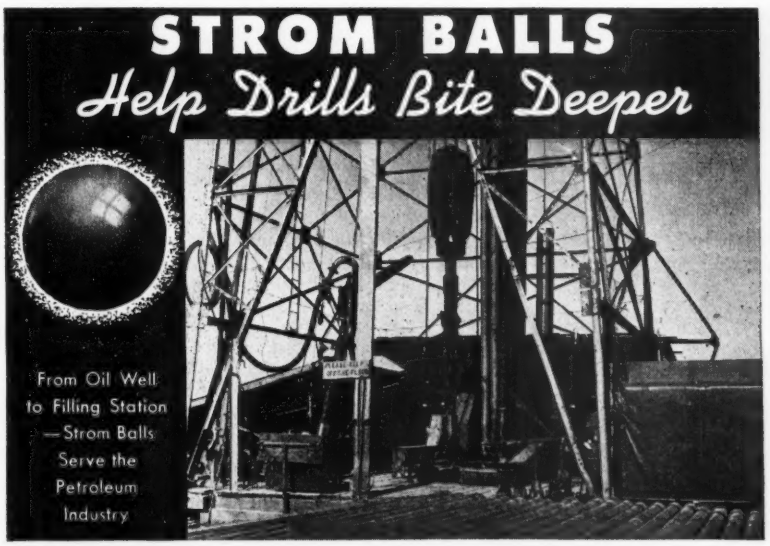
CALIFORNIA SUCCESSFUL WILDCAT

Solano County, Dixon Area: Amerada Petroleum Corp. 2 Wineman Comm., 22-6n-2e, IP 3,530,000 cu. ft. gas, perf. 4,765-85 ft., elev. 13 ft., TD 5,000 ft.

CALIFORNIA WILDCAT FAILURES

Los Angeles County, Whittier Heights Area: O'Melia Oil Co. 9 Pellissier, 17-2s-11w, dry, elev. 346 ft., TD 4,350 ft.

Orange County, El Toro Area: Morton and Sons 174-1 Irvine, 10-6s-8w, dry in basement, elev. 496 ft., TD 4,473 ft.



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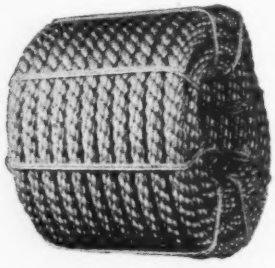

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Among the

Drilling Contractors

Virginia Drilling Co. Active In Central Part of Kansas

Virginia Drilling Co., Wichita, is extremely active in Stafford County, Kansas, with four wells either completed or near the completion stage. Its 1 Grow, SE SE NW 14-21-12, has been brought in with a pump potential of 87 bbl. per day. The Mueller "A," C N½ NW SE 29-21-12, is ready for testing and two other wells, Mueller "B" and Virginia Drilling and Ed Adair 1 Wolf, are rigging up cable tools for completion.

Sam Sanders, Artesia, Tex., is moving in cable tools for a wildcat, the Don M. Oliver and Fred F. Kotyza 1 Garner, 1,980 ft. from north and west lines of 29-17s-27e, North Eddy County, New Mexico. Contract is for 2,500 ft. unless commercial production is struck sooner. The test is 3 miles west of Empire field, and 5 miles east and south of Artesia.

Northern Development Co., Edmonton, Alta, has contract for Lloydminster Gas Co. 13, SW 13, 24-49-28w3, in Lloydminster gas field.

Mallard Drilling Co. has the contract for four Dozier & National Co-op wells in Ellsworth County, Kansas. The 7 Jannsen, NE SW NE 21-17-8, has reached 3,260 ft. and pumped 3½ bbl. of oil per hour. Location has been staked in the same section for the 8 Jannsen, NE NW NE, and the 9 Jannsen, CWL E¼ NE. Mallard is rigging up cable tools to complete the 4 Williams, NE SW NW 22-17-8.

Crescent Drilling Co., Monroe, La., has moved in workover rig to retest McAlester Fuel Co. 1-C Shockley, SE NE 9-17s-19w, Village field, Columbia County, Arkansas. Old total depth is 5,625 ft.

Davenport Drilling Co., Duncan, Okla., has filed for a drilling permit for a wildcat in Kiowa County, Oklahoma. The test is the 2 Gibbs, SE NE NE 9-7n-17w, and the operators plan to start at once for 2,000 ft.

Earl F. Wakefield, Wichita, has the contract for a Stanolind Oil & Gas Co. wildcat, 4½ miles north of the Dopita pool, central Rooks County, Kansas. This test, the 1 Stamper, SE SE NE 6-8-17, is on 4,300 acres controlled by Stanolind.

H. & M. Drilling Co., Leon, Kans., has staked location for its 1 Kimball, NE SE SW 3-27-6e, Butler County, Kansas.

Glen W. Peel, Hoisington, Kans., is drilling a test 2 miles west and ½ mile north of the new Silvers pool, Rooks County, Kansas. Peel has an interest in the test which is the Bird

Day and evening crew of Taber & Coleman Drilling Co. on the Phillips Petroleum Co. Alma lease, TXL field, Ector County, Texas. The men are: Bill Sheehan, driller; F. L. New; J. L. Sheehan; C. S. Huddleston; D. L. Applewhite; D. L. Thornton; Roy F. Applewhite, driller; D. I. West; C. K. Ingram; and Wallace W. Roberts

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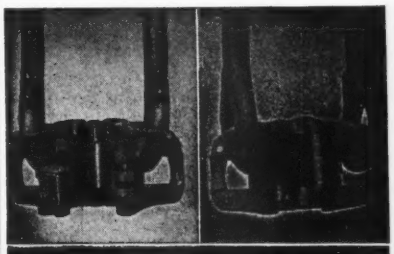

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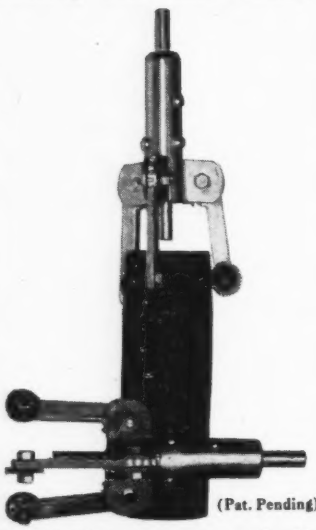

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Manufactured by

Williams Tool Co.
Box 884 **Mexia, Texas**

& Boreing et al 1 Talley, SE SE NW 18-8-19.

Gilliam Drilling Co., Evansville, is expected to complete a producer with its wildcat in Richland County, Illinois, following a favorable drill-stem test. The test is the 1 F. Provines, NW NE NW 34-3n-14w, and is a 380-acre block.

Shaw Petroleums, of Lloydminster, Sask., has contract for Dalo 3, NE 9, 15-50-2w4, in the northwest extension of Lloydminster field.

Baker & Yeager Drilling Co. is the contractor for the M. & L. Oil Co. 1 Melcher, NE NE NE 12-19-4e, 4½ miles east of Propp pool and 8 miles northeast of Marion, Marion County, Kansas. This wildcat is on an 880-acre block.

Western Drilling Co., Longview, Tex., will drill a 7,000-ft. rotary wildcat in Schleicher County, West Texas, for Al P. Groebl, San Angelo, Tex. The test will be the 1 Hayden Baugh estate, Section 8, Block M, GH&SA Survey, on a block of approximately 7,800 acres. It is expected to explore the Ellenburger. Location is about 4½ miles north and slightly west of Page (Strawn) field.

Brunson Drilling Co., Wichita, Ed Adair, et al are drilling a test 1½ miles southwest of the West Drach pool, Stafford County, Kansas. Sinclair Prairie Oil Co. and Phillips Petroleum Co. are supporting this wildcat, the 1 Howard, NW NW SE 15-22-13.

Arrow Drilling Co. has set casing on its A-2 Union Saw Mill, C NW NW SE 8-18s-12w, a wildcat in Union County, Arkansas. Arrow has three other wells under way in this same area. The 5 Union Saw Mill is waiting for cement and the 1 Mattie J. Burns, C SW SE SW 12-18s-14w, is shut in after testing 1,000,000 cu. ft. of gas per day. Arrow is moving in material for 6 Union Saw Mill, C SW SW SW 12-18s-14w.

Earl Wakefield, Wichita, is contractor for the H. R. Lowell 1 Henderson, SW SW NW 6-11-17, Ellis County, Kansas.

General Petroleums, Calgary, Alta., is completing Continental 1, NE 14, 29-46-26w3, in the Saskatchewan section of Lloydminster field.

Kiowa Drilling Co., Wichita, has brought in a producer for Solar Oil Co., the 1 Tammen, SW SW SW 24-19-16, Rush County, Kansas. This wildcat flowed 100 bbl. of oil per day.

Anderson Drilling Co., Oklahoma City, is starting operations on a well near the new South Randlett discovery well, Cotton County, Oklahoma. The well is the 1 Inman, C NL SW NW 8-5s-12w. **Ross Drilling Co.** has staked location for its 2 Dugan 440 ft. east of the discovery.

Goll, Graves, & Mechling are the contractors for a new Michigan wildcat in 22-18n-4e, Standish Township, Arenac County, for Frank E. Roush.

H. H. & B. Drilling Co., Wichita, has completed a producer for 47 bbl. of oil per hour by swabbing in Rooks County, Kansas. This well is the 4 Cabbage, SW NE SW 7-9-18, and is producing from the Arbuckle at 3,488 ft.

Shaw & Sons, Tillsonburg, Ont., are drilling on a deep test for Imperial Oil on Lot 10, Concession 13, Brooke Township, Ontario.

M. & L. Drilling Co. has staked location for its 1 Melcher, NE NE NE 12-19-4e, a wildcat in Marion County, Kansas.

Texola Drilling Co., Inc., Oklahoma City, has discovered a new gas pool, the North Fort Sill pool, with its 1 Tas-Saw in Comanche County, Oklahoma. The Tas-Saw had an initial production of 8,400,000 cu. ft. of gas per day from a total depth of 1,762 ft.

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STANDCO BRAKE LINING

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Standco Brake Lining Co.
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Malleable Iron • Heat Treated • 5 Sizes
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DEI-TA No. 1—1 swivel, ⅜ or ½" chain
DIXIE No. 1—2 swivels, ⅜ or ½" chain
LONE STAR 1—2 swivels, ⅝, ¾ or ⅞" chain
LONE STAR 2—2 swivels, 1⅛, 1¼ or 1⅜" chain

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Smith-Horton Drilling Co., Tulsa, has filed intention to drill the 1-A Bowlegs, SE SE SE 26-9n-6e, Seminole County, Oklahoma, for a 2,400-ft. test.

Merrill Drilling Co., Mount Pleasant, Mich., has been issued a permit to drill a wildcat 12 miles southeast of Kimball Lake field, Newaygo County, Michigan. This test is in SE SE SW 25-11n-12w, Grant Township.

Lowell Drilling Co. is rigging up cable tools to complete the Grover M. Simpson 1 Fee, SW NW NE 18-14-2, Saline County, Kansas.

Scott Drilling, Inc., and Osceola Refining Co. are moving in rotary for a test 1 mile southeast of Kimball Lake field, Garfield Township, Newaygo County, Michigan.

Derby Drilling Co., Wichita, is rigging up cable tools to complete the Sohio Petroleum Co. 1 Thomas, NE SE SE 3-12-18, Ellis County, Kansas.

Rowan Drilling Co., Fort Worth, has brought in a producer, its 5 Parker, 660 ft. from south and west lines, Section 40, Block 45, T&P Survey, T-1-S, on the south side of TXL field, Ector County, Texas. On a drill-stem test it produced 63.43 bbl. in 3 hours and 45 minutes.

Hupp-Hume Drilling Co., Owensboro, Ky., is moving in rotary for the I. B. Browning 1 Viva L. Allen, 4-M-26, Webster County, Kentucky.

Harold Wescott, Oklahoma City, is spudding an outpost for Faultline Oil Co., the 1 State School Land, C NE NW 36-10n-2w, east of the south end of the old Moore field, Cleveland County, Oklahoma. Contract is for 7,500 ft. or the Wilcox.

Herndon Drilling Co., Tulsa, is the contractor for a Texas Co. wildcat, the 1 Barngrover, SW NW NE 35-27-24w, central Ford County, Kansas. The test is based on geophysical work on a 10,000-acre block of Texas Co. and is miles from any production.

Stickle Drilling Co. is rigging up for a Texas Co. wildcat 26 miles west of Southwest Studley pool in Thomas County, Kansas. This test is the 1 Meeks, SE SE SW 36-8-31, and is on a block of 13 sections held by Texas Co.

Tilley Drilling Co., Wewoka, Okla., is moving in tools for the Faultline Oil Co. 1-A Holbrook, SW SW NE 19-17n-3e, on the edge of the Sporn area, Lincoln County, Oklahoma. Contract is for 4,300 ft. and Faultline has 800 acres in the area.

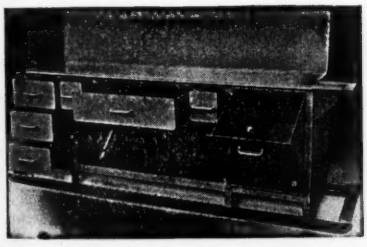
Thorne Drilling Co., Henderson, Ky., is preparing to drill two wells in Henderson County, Kentucky. Location has been staked for the A. S. Mims 1 J. A. & Ivey Russel, 21-Q-20, and rotary tools are being moved in for the J. L. Kennard 1 M. Osteen, NE SW NW 18-Q-25.

LEGAL

CALL FOR BIDS. To sell royalty crude oil accruing to the United States. Sealed bids, in duplicate, will be received in the office of the Director of the Geological Survey, Room 5244 Federal Works Agency Building, Washington 25, D. C., on or before noon, daylight saving time, to be opened at 2:00 p.m., June 19, 1947, for the sale of royalty crude oil in seven separate items accruing to the United States from Federal lands in the Coalinga Nose, Pleasant Valley, Jacalitos Hills, and Santiago fields, California. No bid received after the time fixed for submitting bids will be considered. Contracts for the royalty oil will be for a term of 3 years beginning the first of the calendar month following execution by the Secretary of the Interior. The monthly royalty oil accruals offered for sale amount to approximately 86,500 barrels, ranging in gravity from 17° A.P.I. in the Santiago field to 40° A.P.I. in the Jacalitos Hills field. Bids must be submitted as provided in the specifications. Specifications on the quantities of crude oil offered for sale, the form of bids, the form of contract, and the conditions with respect to bond requirements, deliveries, volume measurements, gravity determinations, and other details relating to the call for bids may be obtained by bidders from the Director, Geological Survey, Department of the Interior, Washington 25, D. C., or the Oil and Gas Supervisor, U.S. Geological Survey, Room 533 U.S. Post Office and Courthouse, Los Angeles 12, California. Sealed bids must be submitted to the Director of the Geological Survey, Department of the Interior, Washington 25, D. C., pursuant to the specifications, the envelope to be marked plainly "Bid on Coalinga Nose, Pleasant Valley, Jacalitos Hills, and Santiago, California, Royalty Oil, not to be opened before noon, June 19, 1947." Oscar L. Chapman, Acting Secretary of the Interior.

OWEN

TYPE "A" WORK BENCHES



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STATISTICS and

WEEKLY WELL COMPLETIONS . . . WEEK ENDED JUNE 7, 1947

	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1947				
	Comp.	Oil	Gas	Dry	Footage	1947	1946	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	45	23	0	†22	63,908	547	683	0	0	0	0	0	3	0	0	2	5
Pennsylvania	32	14	4	‡14	48,352	1,265	1,752	0	0	0	0	0	0	0	0	0	0
West Virginia	13	0	10	3	33,431	325	298	0	0	0	0	0	0	0	1	0	1
Ohio	33	6	14	13	104,256	541	492	0	0	0	4	4	0	0	3	23	26
Indiana	13	5	0	8	24,763	242	130	1	0	0	1	2	8	0	0	20	28
Kentucky	16	9	3	4	21,846	242	195	0	0	0	0	0	6	0	0	20	26
Illinois	42	21	0	21	113,275	792	887	5	0	0	15	20	23	0	0	131	154
Michigan	21	8	5	8	42,320	299	327	0	0	0	6	6	5	0	7	90	102
Kansas	26	13	2	11	79,096	1,041	857	1	0	0	4	5	16	0	9	119	144
Neb., Mo., Iowa	0	0	0	0	0	2	8	0	0	0	0	0	0	0	0	2	2
Oklahoma	71	37	8	*26	247,345	1,677	1,001	0	0	0	7	7	36	2	6	282	326
Texas	185	123	10	52	851,140	3,621	3,497	7	2	1	27	37	126	25	33	542	726
North Central (Dist. 7B & 9)	71	42	1	28	276,885	1,130	1,247	3	0	0	12	15	45	0	7	181	233
West (Dist. 7C & 8)	42	39	1	2	183,995	862	727	0	0	0	1	1	11	0	2	65	78
Panhandle (Dist. 10)	6	3	3	0	18,938	180	158	0	0	0	0	0	1	0	1	2	4
Eastern (Dist. 5 & 6)	8	4	0	4	38,000	209	329	0	0	0	4	4	3	0	2	47	52
Gulf Coast (Dist. 3)	29	18	3	8	199,768	671	786	2	2	1	4	9	32	18	14	113	177
Southwest (Dist. 1, 2 & 4)	29	17	2	10	133,554	569	250	2	0	0	6	8	34	7	7	134	182
Louisiana	23	14	0	9	115,739	519	579	1	0	0	5	6	17	9	5	73	104
Northern	15	10	0	5	38,145	266	311	0	0	0	1	1	0	1	1	40	42
Southern	8	4	0	4	77,594	253	268	1	0	0	4	5	17	8	4	33	62
Arkansas	13	6	1	6	60,741	116	76	0	0	0	3	3	0	0	0	23	23
Mississippi	10	5	1	4	92,945	173	105	0	0	0	4	4	0	0	1	35	36
Southeastern States	2	0	0	2	5,428	20	18	0	0	0	2	2	0	0	0	17	17
Montana	8	5	2	1	15,960	82	117	0	0	1	0	1	1	0	1	11	13
Wyoming	3	0	0	3	10,287	92	75	0	0	0	0	0	7	0	2	14	23
Colorado-Utah	3	2	1	0	13,501	72	51	0	0	1	0	1	1	0	1	14	16
New Mexico	13	8	1	4	58,215	218	155	0	0	0	1	1	4	0	1	14	19
California	35	29	3	3	178,207	844	795	0	0	1	2	3	20	0	3	122	145
Total United States	607	328	65	214	2,180,755	12,730	12,098	15	2	4	81	102	273	36	73	1,554	1,936
Total previous week	492	274	55	163	1,797,222	12,123	11,530	11	2	2	64	79	259	34	69	1,470	1,832
Total June 8, 1946	568	315	64	189	1,873,549			6	0	2	52	60	217	22	52	1,356	1,647

Service wells included: *2, †22, ‡14.

CRUDE PRICES AND REFINERY ACTIVITY

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$1.40	....	....	....
19-19.9	1.45	....	....	....
20-20.9	1.49	$1.55	....	$1.42
21-21.9	1.53	1.57	....	1.44
22-22.9	1.57	1.59	....	1.46
23-23.9	1.60	1.61	....	1.48
24-24.9	1.64	1.63	$1.86	1.50
25-25.9	1.68	1.65	1.88	1.52
26-26.9	1.71	1.67	1.90	1.54
27-27.9	1.75	1.69	1.92	1.56
28-28.9	1.79	1.71	1.94	1.58
29-29.9	1.82	1.73	1.96	1.60
30-30.9	1.86	1.75	1.98	1.62
31-31.9	....	1.77	2.00	1.64
32-32.9	....	1.79	2.02	1.66
33-33.9	....	1.81	2.04	1.68
34-34.9	....	1.83	2.06	1.70
35-35.9	....	1.85	2.08	1.72
36-36.9	....	1.87	2.10	1.74
37-37.9	....	1.89	2.12	1.76
38-38.9	....	1.91	2.14	1.78
39-39.9	....	1.93	2.16	1.80
40 and above	....	1.95	2.18	1.82

*For crude from Laboval, El Campo, and Sandy Point. †Includes Lea County, New Mexico.

A.P.I. REFINERY REPORT, WEEK ENDED MAY 31

(Thousands of barrels)

District—	Crude runs, daily avg.	Production: Gasoline†	Kerosine	Gas & dist. oil	Residual	Stocks at refineries, bulk terminals, in transit and in pipe lines: Gasoline*	Kerosine	Gas & dist. oil	Residual
East Coast	832	1,886	290	997	1,895	20,558	5,431	10,196	7,292
Appalachian:									
District 1	83	222	40	75	59	2,358	205	413	226
District 2	75	217	12	46	123	1,060	64	121	129
Ind., Ill., Ky.	797	2,635	305	814	1,256	18,606	1,423	3,157	2,679
Okla., Kans., Mo.	412	1,457	200	466	505	9,022	475	1,285	1,071
Inland Texas	208	1,011	99	133	367	3,753	253	333	619
Texas Gulf Coast	1,163	3,326	569	1,599	1,707	14,056	2,014	5,996	4,991
Louisiana Gulf Cst.	357	963	328	457	373	4,738	1,130	2,077	1,082
No. La. and Ark.	66	181	50	75	98	1,743	199	357	100
Rocky Mountain:									
New Mexico	11	41	4	10	21	93	13	39	40
Other Rocky Mtn.	140	461	24	169	217	3,110	95	564	613
California	856	2,399	90	891	2,289	16,779	764	11,494	26,382
May 31, 1947	5,000	14,709	2,002	5,732	8,910	95,876	12,066	36,032	45,224
May 24, 1947	4,970	14,927	2,010	5,518	8,292	97,827	11,074	35,212	44,499
June 1, 1946	4,826	14,247	2,069	4,932	8,619	93,960	12,741	33,885	43,845

*Finished and unfinished. †At refineries including natural blended.

Bureau of Mines crude-oil stocks 239,370,000 bbl. as of May 31—up 1,668,000 bbl. One year ago 218,589,000 bbl.

FLAT CRUDE PRICES

Representative posted schedules per bbl.

East Texas	$1.95
Kettleman Hills, California*	1.94
Beauregard Parish	1.90
Illinois Basin	2.07
Pecos County, Texas (Yates)	1.65
Bradford, Pennsylvania	4.05
Eastern Ill. and Western Ind.†	2.07
Tomball, Texas Gulf Coast	2.10

*37°-37.9°. †35° and above.

TRENDS

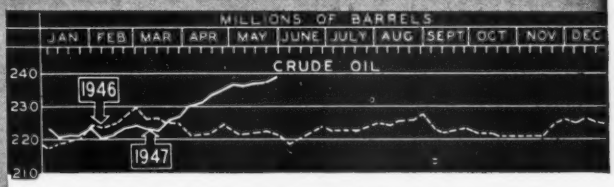
DAILY AVERAGE PRODUCTION FOR WEEK

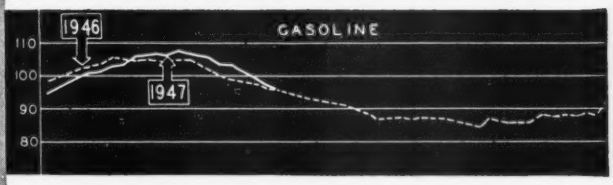
	June 7 crude oil	B. of M. May demand	May 31 crude oil
Alabama	1,200	1,200	1,200
Arkansas	80,150	79,000	80,200
California	918,600	875,000	917,000
Colorado	38,440	39,000	39,200
Eastern	66,500	65,200	63,000
Florida	660	300	1,160
Illinois	188,000	210,000	186,400
Indiana	16,800	18,000	17,900
Kansas	264,900	275,000	291,505
Kentucky	25,400	29,000	25,600
Louisiana	425,200	411,000	419,900
North Louisiana	103,800	.....	103,900
South Louisiana	321,400	.....	316,000
Michigan	38,850	47,000	45,700
Mississippi	93,550	86,000	92,550
Montana	19,740	24,000	22,850
Nebraska	600	700	600
New Mexico	105,950	102,000	105,350
Oklahoma	389,200	380,000	388,900
Texas	2,288,950	2,120,000	2,226,850
Dist. 1 (Southwest)	21,650	.....	21,100
Dist. 2 (Southwest)	166,550	.....	159,160
Dist. 4 (Southwest)	247,720	.....	243,415
Dist. 3 (Gulf Coast)	494,480	.....	485,170
Dist. 5 (Eastern)	39,950	.....	38,360
Dist. 6 (Eastern)	116,100	.....	112,500
East Texas field	334,000	.....	338,000
Dist. 7-C (West)	39,500	.....	36,795
Dist. 8 (West)	560,750	.....	530,125
Dist. 7-B (W. Central)	39,000	.....	38,200
Dist. 9 (N. Central)	141,500	.....	137,800
Dist. 10 (Panhandle)	87,750	.....	86,225
Wyoming	114,450	108,000	114,380
Miscellaneous	.....	600	.....
Total United States	*5,077,140	4,871,000	5,040,245
Change from prev. wk., up 36,895			

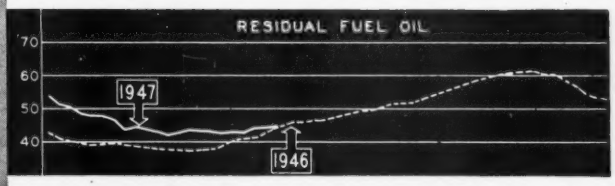
Total production January 1-June 7..... †771,604,870 bbl.
Same period last year (crude plus cond.).. 741,111,229 bbl.

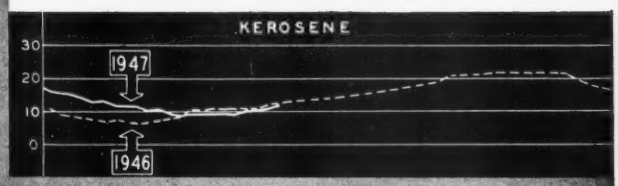
*Not incl. 32,960 bbl. condensate. †Incl. 4,445,870 bbl. condensate.

OIL STOCKS IN THE UNITED STATES

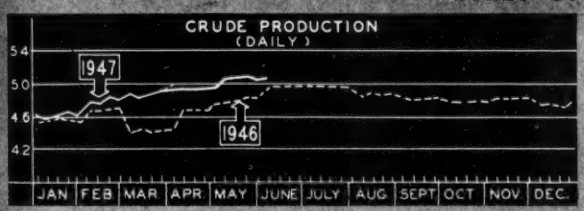


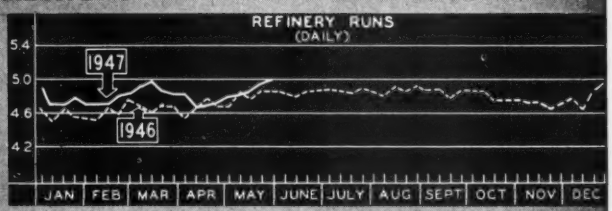




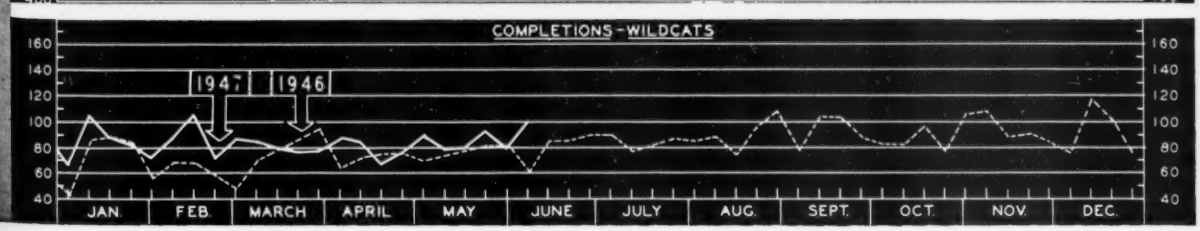


DAILY OPERATIONS

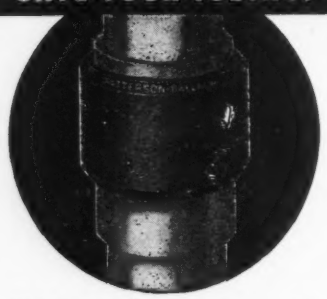




Solid line charts weekly completions, service wells in Eastern area included.



"Best Bet Yet"
SAVE YOUR TUBING!



Tubing collars worn by contact with casing steal the profit out of pumping. Patterson-Ballagh Plastic Tubing Protectors prevent both collar and casing wear. Oil-proof, wear-resistant, insulating. They are pressed onto the collar under pressure and will not come off. Made in all sizes. End your tubing troubles. CALL in your Patterson-Ballagh man.

Specify "Best Bet Yet"
PATTERSON-BALLAGH
A DIVISION OF BYRON JACKSON CO.
PLASTIC
TUBING PROTECTORS

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6247 Navigation Blvd., HOUSTON 11
931 Russ Bldg., SAN FRANCISCO 4
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PENN SALT

Anhydrous

HF

Effective and practical alkylation catalyst for production of high octane motor fuels.

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Also finding use as condensation reagent. Of increasing interest in polymerization, isomerization and acylation reactions.

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Write for helpful booklet, "How to Handle Anhydrous Hydrofluoric Acid Safely."

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1000 WIDENER BUILDING, PHILADELPHIA 7, PA.
New York • Chicago • St. Louis • Pittsburgh
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MARKETS

INCREASES of a half cent a gallon in the tank-wagon price for all distillate fuels and 0.3 cent a gallon for residual fuels by Standard Oil Co. (Ind.) highlighted the petroleum-products market during the past week.

Company officials said the increases were due to the rapidly growing demand for the products. With home heating oils and heavier fuels becoming first-line products, they said, consumers of these products, which now are competing with gasoline for the available crude oil, must pay prices more closely related to the prices for gasoline.

The new prices were effective in Michigan, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas, and Oklahoma. Similar increases were posted by Standard Oil Co. (Ohio) with the advance ranging from 0.4 to 0.6 cent a gallon.

Suppliers predicted the increases would have no effect on tank-car prices pointing out that tank-car prices have been comparatively higher and that the tank-wagon prices are just catching up.

Crude Advance Rumored

Rumors of an impending increase in posted crude-oil prices were heard in East Texas during the past week as the acute crude shortage continued and demand for refined products remained strong.

One large operator was reported changing connections for a contract providing for a price 20 cents a barrel above the posted price. Bonuses for well connections in the area have been the rule for some time, but the 20-cent increase is the largest reported to date.

Throughout the Mid-Continent marketers were anticipating a general upward adjustment in crude prices, with many feeling the increase would come within the next month.

Mid-Continent tank-car prices for all petroleum products generally remained firm during the past week, with gasoline and furnace oils reported particularly tight. The acute shortage of No. 6 fuel oil, which had sent the price to a postwar high of nearly $2.50 a barrel, was reported easing off. Marketers, however, were of the opinion the slackening in demand was only of a temporary nature. Demand for kerosine also was reported off.

Eastern Heating-Oil Situation

Heating-oil supplies for the coming winter, a question mark in the supply picture, will be made adequate by a 50 per cent drop in exports. A. J. McIntosh, Socony-Vacuum Oil Co., Inc., economist, predicted last week. McIntosh estimated total United States exports would drop from a 1946 average of 80,000 bbl. daily to about 39,000 bbl. this year. East Coast requirements will be 17.3 per cent higher this year, with heavy fuel-oil requirements 9.3 per cent higher, gasoline 7 per cent higher, and kerosine 18.6 per cent higher, he said.

In San Francisco, the joint Army-Navy Petroleum Board predicted it might be necessary to dip into civilian supplies in order to meet products needs of the armed forces this year. Navy officials predicted the Navy will be about 50 per cent short of all types of fuel oil, gasoline, lubricating oil, and other products and about 60 per cent short of diesel-fuel requirements.

Representative Quotations

Representative spot-market quotations of leading suppliers as of last Monday. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel.

GASOLINE, KEROSENE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor	Texas Gulf Coast
Regular gasoline, 73-75 octane	8-8.5	10.1-10.4* 9.3-9.5†	8.5-8.75
Premium gasoline, 78-80 octane	8.75-9.5	10.2-12	9-9.5
42-44 w.w. kerosine	6.875-7.25	7.8	6.875-7.125
No. 2 straw fuel oil	6.125-6.625	6.8-7.1	5.75-6
No. 6 residual	$1.79-2.45	$2.32	$1.80-2.00

*Branded (74-76 octane); †Unbranded (74-76 octane).

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5.375	4.875	5.125
Grade 18-55	6.45	5.85	6.15

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	11-12.5
750 vis., No. 3-4 neutral	13-15.25
2,000 No. 5-6 neutral	14.5-16.75

LUBRICATING OILS

Mid-Continent

150-160 vis. D bright stock, 0-10 p.p.	29
200 vis. No. 3 neutral, 0-10 p.p.	18-20

Western Pennsylvania

145-155 vis. 10 p.t. bright stock	42
180 vis. 0 p.t. neutral	48

CRUDE-SCALE WAX

130-132 A.S.T.M. melting point	7.75

Equipment Men in the News

M. T. MEADOWS

M. T. Meadows is the president of the new company, Geotecnica Sociedad Anonima Comercial e Industrial, Buenos Aires. Its technical director is **Dr. Francisco P. de Luca Muro,** a geophysicist of international repute, former head of the research department of the Argentine Government Oil Fields. The object of the concern is to engage in oil-survey work and the distribution of oil supplies in the south half of South America. The company now has the exclusive sales rights for Engineering Laboratories, Inc., Tulsa, as well as the radioactivity logging franchise from Well Surveys, Inc., Tulsa.

F. O. Wilson has been appointed Elliott Co. Cincinnati district manager. Wilson, an electrical engineer graduate of Kansas University, came with the company in 1938. He was sent as a field engineer to the Kansas City office in 1940, moved on to the Tulsa office in 1942 and became Tulsa manager in 1945.

Walter Geist was elected for his sixth term as president of Allis-Chalmers Manufacturing Co. as all directors and officers of the firm were reelected at the annual meeting of the stockholders and the board of directors. The directors elected by the stockholders are: **W. C. Buchanan,** Geist, **Walter Kasten, Alfred J. Kieckhefer** and **Louis Quarles,** all of Milwaukee; **Arthur W. Butler,** New York, N. Y.; **John H. Collier** and **James D. Cunningham,** Chicago, Ill.; **Ernst Mahler,** Neenah, Wis., and **Leigh Willard,** Cleveland, Ohio. In addition to Geist, the officers elected by the board of directors are: **J. A. Keogh,** vice president and comptroller; **H. W. Story,** vice president and general attorney; **W. E. Hawkinson,** secretary and treasurer; **E. H. Brown,** vice president in charge of engineering development; **W. C. Johnson,** vice president in charge of general machinery division; **W. A. Roberts,** vice president in charge of the tractor division; and **James M. White,** vice president in charge of manufacturing. Other officers chosen by the board are **J. F. Ryan,** assistant secretary and assistant treasurer; **A. F. Rolf,** New York, assistant secretary; **C. P. Allendorf,** assistant comptroller; **N. D. Johnson,** assistant secretary, and **G. F. Langenohl,** assistant treasurer.

Ivan F. Baker has been elected vice president of Westinghouse Electric International Co. He has been treasurer of the company since September 1945, a post he retains along with that of director of the company.

H. E. LOWREY

H. E. Lowrey will head the new sales office of Continental Supply Co. recently opened in New Orleans at 519 Whitney Building. The New Orleans office will be under the supervision of **Raleigh Nortenstine, Jr.,** New Iberia, La.

J. H. Deaderick, a vice president, and **E. L. Murray,** credit manager, have resigned to become distributor for Caterpillar Tractor Co. in Arizona; **E. W. Jackson** has been named director of parts and service; **M. T. Deems** is promoted to general parts manager, and **W. Blackie,** vice president, adds administrative guidance of the traffic department to his duties.

Houston Oil Field Material Co., Inc., announces the opening of a new branch store at Bay City, Tex., with **Frank Watts,** store manager. Another store at Brookhaven, Miss., has been opened with **A. O. Meadows,** store manager. Personnel changes include the transfer of **J. R. Yost,** fishing-tool operator, from New Iberia, La., to Oklahoma City; and **R. M. Acuff** from Natchez, La., to Brookhaven, Miss. **Seale Martin** has been made store manager at Premont, Tex.

L. A. LUNDSTROM

Peterbilt Motors Co., with factory and general offices at 107th Avenue and MacArthur Boulevard in Oakland, has just been purchased from the estate of the late T. A. Peterman, prominent Tacoma lumberman, who, with **L. A. Lundstrom,** founded the concern on the assets of Fageol Motors Co. Officers of the concern are: **L. A. Lundstrom,** president; **F. E. Matthews,** vice president and production manager; and **W. M. Fanning,** secretary and treasurer. Among the key operating personnel who are prominent in the new ownership are: **L. R. Scholl,** sales manager; **Al Ramos,** parts and service manager; **E. S. Ross,** chief engineer; and **O. D. McKinney,** director of purchases.

Joe Larkin has been appointed chief chemist in charge of rubber research for Patterson-Ballagh division of Byron Jackson Co.

J. J. O'Neill has been appointed assistant manager of the fleet sales section, Ford Motor Co. truck and fleet sales department. **S. M. Copland** is manager of the fleet sales section.

Marman Products Co., Inc., announces the appointment of **Howard R. Carlson** to head the recently formed section of petroleum field service engineering. This section will have a two-fold purpose. The first will be to study the clamping problems of the petroleum industry in order to engineer, develop, and present new and more efficient clamping devices. The second will be to extend customer service in working out field clamping problems and in meeting emergency delivery requirements.

C. R. (Pete) Heller, Washington representative of Link-Belt Co., has reestablished a sales office in Washington, D. C., at 1009 Washington Gas Light Building. Heller's duties will be confined to work with foreign purchasing commissions and with the governmental and armed service bureaus located in Washington. Industrial sales in the District of Columbia will continue to be handled by the company's office in Baltimore.

H. P. Hearn, who joined Halliburton Oil Well Cementing Co. in 1925, at Henderson, Tex., has been promoted from assistant superintendent to superintendent of the East Texas division, with offices in Kilgore and Dallas. He replaces **W. H. Baker,** who resigned to enter the contracting business with **Jay Taylor** in the firm of Baker & Taylor, Amarillo, Tex. **Rubert L. Northcutt,** superintendent of the South Texas division for the past 2 years, has been transferred from Houston to Flora, Ill., where he will direct the company's operations in Illinois, Indiana, Kentucky, Ohio, Michigan, and West Virginia. Replacing Northcutt in the South Texas territory is **H. P. Conroy,** superintendent of the eastern division at Flora since June 1944.

Hinderliter Tool Co., Tulsa, recently held its first sales conference since it became a subsidiary of H. K. Porter Co., Inc. Field sales representatives in attendance were: Front row: M. B. Thompson, Odessa, Tex.; M. B. Merrill, Tulsa; O. B. Morphew, Tulsa; L. B. Lyons, Clay City, Ill.; J. O. Simpson, Wichita Falls; F. W. Budde, Tulsa; W. R. Donovan, Tulsa. Second row: D. C. Walker, Tulsa; C. M. Anderson, Greggton, Tex.; S. W. Collins, Great Bend, Kans.; W. B. Starmer, Tulsa; P. T. Spence, Odessa, Tex.; L. W. Cashdollar, Tulsa; E. F. Ellis, Tulsa. Third row: C. E. Grooms, Seminole, Okla.; L. L. McColm, Fort Worth; N. B. Bryant, Tulsa; H. L. Arrowood, Tulsa; Harvey Petross, Casper, Wyo.; J. G. Russell, Seminole, Okla.; W. T. Lee, Houston; G. A. Hays, Tulsa; R. H. McKay, Tulsa; F. J. Wilbanks, Seminole, Okla.; W. E. Swartz, Tulsa

Classified Advertising

The Market Place for the Oil Industry

EQUIPMENT FOR SALE

2 CARDWELL H Units, Mast, Tools, Truck and Pickup. Complete list. Write: B. J. Murray, 419 N. Terrace Drive, Wichita, Kansas.

RL Double Drum Cardwell Spudder complete with lines, tools, doghouse and lightplant. Reasonable. P. O. Box 1843, or phone 8-3587, Oklahoma City, Okla.

FRANKS Model F-47 shot hole drill on 1942 1½ ton Chevrolet, and 500 gallon water truck. Price $6000.00. Box B-777, The Oil and Gas Journal, Tulsa, Oklahoma.

2 COMPLETE Cable Tool Drilling Rigs with Derricks, Waukesha Engines, O.C.S. Reverse Clutches and Sand Reels; all Drilling, Casing and Fishing Tools from 20" to 5" inclusive. Box B-782, The Oil and Gas Journal, Tulsa, Oklahoma.

NEW WELDED STEEL TANKS: Used Welded & Bolted Steel Tanks, Grain Tanks, 8—5,000 bbl. New A.P.I. Bolted Steel Tanks, 3—10,000 bbl. New A.P.I. Bolted Steel Tanks. Reset tank work. Independent Tank Co., Seminole, Oklahoma, Box 192, Phone 977.

1 No. 3 National Drilling Machine complete, extra good tools 18" down to 5". New Caterpillar Diesel 13,000. New Kolhon Light plant. National poles, dog house, drilling lines, hand tools, a complete outfit, price $15,000.00. A. D. Allison, 715 Brown Bldg., Wichita, Kansas.

1 Steam Rotary Rig suitable for 6000 ft., ready to rig up with all tools and accessories. Includes 7700 ft. 4 in. drill pipe, and 2 122 ft. derricks. For further information, call Jackson 3-1724, or write Box 214, Jackson, Mississippi.

MODEL R Cardwell, double drum unit with 65' telescoping mast and rotary table drive assembly. Model HP 600 Cummins engine. Complete with lines, tools, and dog house.

FRENCH TOOL & SUPPLY CO.
1208 Atlas Life Bldg., Tulsa, Oklahoma

New and Used
VALVES and FITTINGS
VICTORY SUPPLY COMPANY
Phone 5-2073 **P.O. Box 754**
Tulsa, Oklahoma

EQUIPMENT FOR SALE

FOR SALE: Six New Kobe, 2⅛ inch tubing insert, pumps, one Triplex—Bargain for immediate sale. Ben Beckham, Jr., Box 134, Overton, Texas. Phone 3921.

FOR SALE: Shaffer power draw works, powered by two J. L. 1335 Buda engines compounded. Suitable for 5,000 foot work. In A-1 condition. Price $7,500. Terms. Melton Well Service, Box 1360, Seminole, Oklahoma.

FOR SALE: At Oil Hill, Kansas, 26 joints, 18'—20' Random Lengths, 2⅜" OD Drill Pipe with Hughes Tool Joints, for Core Drill Machine, price $1.50 per foot. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

Model 200 Sullivan Drill mounted on 1941 tandem White truck, complete with all drilling accessories, 1800 ft. 2⅞ in. drill pipe, 5 x 8 Gardner-Denver Pump, Kohler light plant, etc. Purchased new in May 1945. Never drilled below 1500 ft. Located at Grandfalls, Texas. Write Box 1022, or call 813 Del Rio, Texas.

FOR SALE
STEEL STORAGE TANKS
38—10,000 Gallon Capacity Tank Car Tanks
CLEANED PAINTED TESTED
Located in Oklahoma
IRON & STEEL PRODUCTS, INC.
42 years' experience
13412 S. Brainard Avenue
Chicago 33, Illinois. PHONE BAYport 3456
"ANYTHING containing IRON or STEEL"

SHOT HOLE DRILLS
LARGE AND SMALL

All are truck mounted, rotary, chain pull down, smallest pump size is 4 x 6 Condition of same is excellent, others are in need of repair. Price F.O.B. Dallas is from $3,000 to $8,000 with truck. For details write:

8806 Lemmon Avenue
Dallas, Texas

LATEST TYPE
DIESEL AIR COMPRESSOR
300 H.P.

Clark Right Angle Model D32, 3 Cylinder 14" bore 14" stroke Air End 21" and 12½". Complete with all equipment, wrenches, etc. Machine operated only three months in Clarks Dresser Plant at Bradford. Now located near Bradford, Penna. Crated for immediate shipment.

PRICE ONE HALF OF PRESENT QUOTATION
ADDRESS:
NORTHERN ORDNANCE INCORPORATED
W. M. Cordner—Sales Manager
Minneapolis, Minnesota **Telephone: Granville 7201**

EQUIPMENT FOR SALE

WELL DRILLING Machines, Spudders, Standard Outfits. Complete stock cable tools Used equipment reconditioned. Some Government surplus. Pressey & Son, Pueblo, Colorado.

50 WINCH lines ½" x 250'-4' tail chain, entirely assembled. Also 10,000' ⅝" preformed plow steel cable hemp center, original spool. Box B-780, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: Pumping Units. All types & sizes. New and used. Bridgeports, Jensens, Americans, Atlas, Ideco, with or without Power. Glenn Supply Co., 3600 Sand Springs Road. Phone 3-9607. Tulsa, Okla.

PUMPS
2—NEW Quimby 3¼" Steam Jacketed Asphalt Pumps; 100 GPM, 100 PSI. External Gears and Bearings. Temp. to 800° F.
1—NEW B-J Model HSM Centrifugal Process Pump, size 1½" x 2" x 10" Max. Capacity 120 GPM at 310' Head. .82 Gravity Oil. PRICED TO SELL
COAST EQUIPMENT CO.
948 Bryant St., San Francisco, Calif.

PARTS FOR ARMY TRUCKS
New and Used

Largest stock in America, 6x6, 6x4, 4x4, 4x2. All items guaranteed. Largest auto wrecking house in the west with most complete stock of new and reconditioned parts for all cars and trucks. Fast service.

PIONEER AUTO WRECKING CO.
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WE BUY and SELL
Steel Pipe and Tubing
Pipe Fittings—Well Casing
Culverts and Valves
SONKEN-GALAMBA CORP.
2nd & Riverview, Kansas City 18, Kans.

HYDRAULIC PUMPS

Aldrich Pump Co. Vertical Triplex HYDRAULIC PUMPS, 2¾" x 8", equipped with Herringbone gears, 67.5 GPM. Maximum pressure for intermittent duty 2,200 lbs., for continuous duty 1,800 lbs. Pump and motor mounted on common bed plate.

Motors are 75 HP, 3/60/220-440 volts, 1740 RPM. Complete with starting panel, consisting of G.E. motor starter switch, push button control, square "D" Switch, and capacitator.

Purchased new 3½ years ago. Excellent condition. Available for immediate delivery.

CONSOLIDATED PRODUCTS CO., INC.
17-20 Park Row, New York, N. Y.